



## Automating Production of Cross Media Content for Multi-channel Distribution

[www.AXMEDIS.org](http://www.AXMEDIS.org)

### DE4.9.1.3

## The Usability Issues for the AXMEDIS Production Tools, update of D4.9.1.2

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## 1 Executive Summary and Report Scope

AXMEDIS is researching and producing innovative tools for content production which will be integrated in an open P2P tool (AXEPTool) at which any CMS could be joined for content production and distribution in the B2B environment of AXMEDIS. The added value of the AXMEDIS tools will be reduced costs and allowing production and formatting on demand. A number of sustainable demonstrators and take up actions will demonstrate a content production process respecting the business of SMEs, permitting access to relevant content and producing content at reasonable cost.

The objective of this work package is to assure that the AXMEDIS project develops tools and applications which in the end correspond to the needs of prospective users. Competence was developed in the consortium early and proactively so that user issues can be integrated into the development from the start rather than carried out as a separate activity.

The user aspects implied by an ambitious project such as AXMEDIS cover the entire innovation cycle- not just RTD, and require actions which are specific and appropriate to the different phases of the lifecycle. While the appropriate approach is a user- centred and iterative development process with participation of users in all phases, we must take into account that professional users can not allocate great resources to test different prototypes, due to prohibitive cost in terms of time and human resources. Measures will show the success in terms of user quality and acceptance.

The principle pursued is to involve users early, to analyse their needs and requirements (using as input the result from WP2 Continuous Requirements Analysis, and feeding back results from user needs analysis) , then to embed usability testing into all development activities to provide early feedback for design iterations. In order to reach the implementation and trial phase early and effectively, users – especially professional users – were prepared by workshop activities and training where they were introduced to new technology, and the possible impact and planning for their processes and existing systems.

Training must show that users enter into trials well prepared. The training activities addressed (in WP7) a large audience, including potential future participants. It complemented the technical system development and the dissemination activities.

The business context foreseen for the AXMEDIS applications is cost sensitive. Clearly demonstrable benefits are intended, shown by measures relating to all aspects of cost for individuals and organisations: Resources, time, effort and workload, learning cost and human resources, and risks and opportunity costs. It should be demonstrated in analyses, case studies and trials that decisive and attractive benefits can be offered, both in objective and subjective measures, and that these can realized in realistic trials.

For the users the quality of the technology and the fit to their processes and needs are equally important criteria for accepting new applications. (They are not additive, but multiplicative: Both conditions must be met!). At the beginning of the trials, and more conclusive at the end of the project, user organizations should be presented with a well founded vision of the benefits of using the new applications, and will be prepared to enter into trials.

The social and business processes which are supported by the tool will be addressed. A powerful new set of tools must be based on a working and operational socio-technical infrastructure, and must add clear value by introducing modified workflows. Usability is a condition for the efficiency and acceptance by users. The implementation of the tools will demand some re-engineering of the known and understood workflows. The aspects relating to the introduction of new tools, the transition of work processes and the user qualification will be investigated.

Chapters 2 illustrates the state of the art of user validation and the technical implementation of a user-centered development process. The purpose of user validation is to assure that the result of the project – the

AXMEDIS framework and tools – is in agreement with the needs and requirements of customers and users, and is accepted by them in the end.

Chapter 3 reports the final results of usability inspection of the AXMEDIS Tools Version 2.7.4.2 and AXEPTool Version 3.2.23. The overall stability of the tools has increased. Less severe programme crashes were observed. Visibility and consistency have been improved considerably as well as the terminology used in the tools. Nevertheless the complexity of the AXMEDIS Tools has increased enormously in the last year and new deficiencies are visible which are reported in this chapter.

Chapter 4 summarizes the results of informal user testing of the AXMEDIS Tools performed by the user partners in the AXMEDIS project and in the Take-up actions.

Chapter 5 reports about the formal user tests of the AXMEDIS Tools Version 2.7.4.2 including AXEPTool Version 3.2.23. Formal user tests were planned in collaboration with the user partners and user tests have been performed by the user partners. This activity is still in process and there will be updates of the results of user tests in the next 2-3 months.

The main objectives were to assess the costs and benefits of the AXMEDIS Tools for individual users with respect to workflow efficiency, added value compared to the current way of working, user satisfaction and acceptance of cross-media publishing with AXMEDIS Tools and to assess the potential business benefit of the AXMEDIS Tools (workflow efficiency and cost/benefit for the organisation).

The extent to which the icons for the AXMEDIS Tools on the desktop are understandable for the users was stressed as an additional important usability issue and is tested with about 20 users. (data from 15 users are already available).

Separate user tests are carried out for AXMEDIS Content Production Tools, AXMEDIS Content Distribution Tools, and AXMEDIS Workflow Management Tools.

The user samples consist of employees from the user partners and from AXMEDIS Take-up actions, users who are involved in AXMEDIS and users who are not involved in the project.

The user tests of the AXMEDIS tools and AXMEDIS Workflow Management Tools are still in progress. The preliminary results from all user tests (so far 23 users) confirm findings from usability inspection and informal user testing. Most of the users are not satisfied with the AXMEDIS Tools and Workflow Management Tools. Some negative comments were associated with bugs that can be expected in a prototype and with the lack of some basic features. Many users, especially the beginners, seem to be overwhelmed by the many windows, sub-windows, menus, icons, buttons of the AXMEDIS Tools. Object creation itself is not considered difficult, but users encounter problems with the DRM editor, Visual (SMIL) Editor, Content Processing Plug-ins, Metadata Editor and Protection Editor. Some users bring it to the point and complain about the lack of inconsistency.

Nevertheless most of the users see the added value and challenges for the future, the possibilities of being able to edit multi media resources, to take advantage of an integrated license editor, etc. With regard to the AXMEDIS WFM Tools users do not expect significant advantages for their personal efficiency and effectiveness. However, they are convinced that the AXMEDIS WFM Tools improve the quality of their work.

The results of the SUMI questionnaire, used to measure how users feel about the AXMEDIS Tools and AXMEDIS WFM Tools show results which lie below 50, below average, on the global usability scale as well as on all sub-scales (Efficiency, Affect, Helpfulness, Control, Learnability). Good software should achieve scores higher than 60 or more on most sub-scales. A brief investigation showed that beginners amongst the test users rated the tools less negative than the users who are familiar with the tools. The reason why the results for the AXMEDIS Tools are low needs to be investigated further.

The following changes have been performed compared to the previous report DE4.9.1.2:

- Chapter 3 contains an update of the results of usability inspection.
- Chapter 4 contains an update of the results of informal user testing.
- Chapter 5 is completely new. It described work started in year 3.



## 2 Work performed in previous years

### 2.1 Introduction

AXMEDIS is researching and producing innovative tools for content production which will be integrated in an open P2P tool (AXEPTool) at which any CMS could be joined for content production and distribution in the B2B environment of AXMEDIS. The added value of the AXMEDIS tools will be reduced costs and allowing production and formatting on demand. A number of sustainable demonstrators and take up actions will demonstrate a content production process respecting the business of SMEs, permitting access to relevant content and producing content at reasonable cost.

The objective of this work package is to assure that the AXMEDIS project develops tools and applications which in the end correspond to the needs of prospective users. Competence is developed in the consortium early and proactively so that user issues can be integrated into the development from the start rather than carried out as a separate activity.

The user aspects in AXMEDIS will cover the entire innovation cycle- not just RTD, and the activities carried out will be specific and appropriate to the different phases of this lifecycle. The development process is user-centered and iterative with participation of users in all phases. Measures will show the success in terms of user quality and acceptance.

The principle pursued is to involve users early, to analyze their needs and requirements (using as input the result from WP2 Continuous Requirements Analysis, and feeding back results from user needs analysis), then to embed usability testing into all development activities to provide early feedback in such a way that intermediate design and development results can be improved. In order to reach the implementation and trial phase early and effectively, users – especially professional users – will be prepared by workshop activities and training where they will be introduced to new technology and the possible impact and planning for their processes and existing systems, as well as to the procedure of and to the selected methods for user validation.

Training must show that users enter into trials well prepared. The training activities will address a large audience, including potential future participants of take-up actions and related projects. It complements the technical system development and the dissemination activities.

#### **State of the art**

User validation is the technical implementation of a user-centered development process. The purpose of user validation is to assure that the result of the project – the AXMEDIS framework and tools – is in agreement with the needs and requirements of customers and users, and is accepted by them in the end. User validation, including such topics as analysis of user needs, contextual inquiry and design, usability inspection, usability testing, or user preferences and satisfaction measurement, is a mature approach now, based on scientific knowledge, and proven and tested methods. There are a number of sources of information, including textbooks and practical guidance, which help to introduce the approach into development teams and projects.

We refer to the introductory information, handbook, and extensive information on methods used in user validation which is available on [www.vnet5.org](http://www.vnet5.org). The site introduces to the procedures and methods which we consider sound and proven, and which cover all aspects of user validation – although this is by no means the only view of best practice in the field, and others offer similar information. This is the main source for further information to most of the methods which we consider valid and recommend. Brief descriptions are given for the practitioner who has to plan user validation in a development project, and links to further information.

A question that may be raised is whether the same methods which were developed in the context of office software, transaction processing, communication devices or navigation tools are applicable to products which focus on the production of cross media content for multi-channel distribution, and which are highly innovative. We argue that this is a domain with some additional challenges, which are met by carefully adapting the methods and approach used, but it largely presents the same problems for user validation as any other software development project.

The innovative challenge will be met by using care in the approach, and awareness of the fact that comparison with existing integrated applications and the use of previous experience is not possible. Specific challenges for user tests in the AXMEDIS project are the following: AXMEDIS integrates different challenging tools. The technical risk of this approach may be reduced by investigating and understanding the preferences of users for new functionality and the value of new functionality to users. Some expectations for workflow and process efficiency can only be realized after relatively large scale implementations of demonstrators have been in operation for a while.

Chapter 3 introduces to user-centered development and user validation to familiarize the project partners with the terminology. The specific challenges for the AXMEDIS project are identified in this chapter:

- Efficiency of workflow and process
- Cost/benefit and added value
- Usability of a scripting language for content processing
- Usefulness of metadata for information retrieval.

Chapter 4 describes the approach to user-centred development and user validation in the AXMEDIS project in detail.

In chapter 5 relevant evaluation methods for AXMEDIS are described. Traditional usability evaluation methods focus on the evaluation of the quality of use of user interfaces. New methods may have to be developed for the evaluation of the specific challenges listed above.

The results of usability evaluation will be input to the assessment and evaluation data in WP 10.

## 2.2 Purpose of user-centered development

The purpose of user validation in RTD projects is to assure that the result of the project - here the AXMEDIS framework and integrated tools - is in agreement with the needs and requirements of users and customers, and is accepted by these in the end. User-centered development, including activities such as analysis of user needs, usability testing and user satisfaction measurement, is a mature field today, based on scientific knowledge, proven and tested methods. A number of sources of information, including text books and practical guides help to introduce the approach into development teams and projects. We refer to VNET5 ([www.vnet5.org](http://www.vnet5.org)) as the main source for further information to most of the methods which we consider valid and recommend. VNET5 contains introductory information, a handbook, and extensive information on the selection of appropriate methods for user validation. The site introduces to the procedures and methods which we consider sound and proven, and which cover all aspects of user validation. Although, this is not the only view of best practice in the field. Other sources offer similar information (Dumas & Redish 1993, Hix & Hartson 1993, Isensee & Rudd 1996, Mayhew 1999, Nielsen 1993 and 1994, Preece 1994, Vredenburg et al 2001).

The tools which are developed in AXMEDIS include functionality for the production of cross media content and for multi channel distribution. The innovative aspects are that the AXMEDIS tools will be integrated in an open P2P tool (AXEPTool) at which any CMS could be joined for content production and distribution in the B2B environment of AXMEDIS. The added value of the AXMEDIS tools will be reduced costs, increased efficiency of the production process, and allowing production and formatting on demand. The AXMEDIS tools will carry out some of the work procedures automatically and these innovative functions will only be partly visible to users.

A question which has been raised frequently in connection with other innovative and advanced applications is whether the same validation methods which were developed in the context of predominantly procedural applications such as office software, transaction processing, or devices for communication and navigation are applicable to innovative products with new functionality.

We argue that these are separate issues, each to be dealt with an appropriate approach and valid and applicable methods:

- A large part of the AXMEDIS framework and tools present the same problems for user validation as any other software development project, and suggest that proven and well known methods for user tests and validation are used. The main objective is to assure that the tools correspond to the needs and requirements of users (eg. friendly and robust user interface, easy to use).
- Innovative challenges are the evaluation of workflow and process efficiency, the analysis of cost/benefit and added value, usability of a scripting language for content processing and the evaluation of the usefulness of metadata for information retrieval.

A question which will be asked is whether the AXMEDIS framework with integrated tools improves significantly user performance and the subjective user experience. The total system performance, including the effects of user behaviour and user experience, and the resulting business benefits is assessed by looking at global cost and performance parameters and the value of innovative and automated features, and does not specifically evaluate individual aspects of the underlying innovative technology.

### 2.2.1 Continuous collaboration with users and customers to assure acceptance

User-centered development, that is the continuous collaboration with users in the analysis and evaluation of the technical concepts and results during the entire development process, has produced consistently positive results in the development of successful new products and services. The main aim of user centered

development is to avoid the disappointment of development projects which do not meet their great expectations. It attempts to achieve this in two ways:

- By ensuring that the solution which is developed is free from obvious defects and is as close as possible to user needs,
- By providing sound and reliable information about the value and applicability of technology, also in comparison to competing solutions (benchmarking).

Independent of the type of product, service, or industry considered, there is only one reliable approach to assure that at the end of the development process the result is accepted by users: To involve users from the start of the development process in an effective manner. Effective means that valid - correct and relevant - information is collected from prospective users and other stakeholders, and that it is used to improve the solution under development.

It is important to distinguish between the different types of stakeholders:

**Users** are the individuals who in the course of their work interact directly with the product or service which is developed. The acceptance criterion of users is that they are able to carry out the intended work tasks efficiently and successfully, and without undue problems or stress, and in addition that their subjective assessment of the innovation is positive. The positive subjective user experience becomes increasingly important in situations where the user is free to make use of the innovative features, and integrate them into his normal working procedures, or to disregard and not use them. Professional users will use the AXMEDIS framework and tools to produce content for consumer end-users. There will be also be 'prosumers', users who create and consume content.

**Customers** are organizations (or individuals) which decide about the investment (eg into the AXMEDIS framework and tools), and which must be persuaded of the value of a new technology. The acceptance criterion of customers is the total cost/benefit advantage obtained by the introduction of innovative technology. This also includes non-monetary factors such as the consequences for human resource management and the positive acceptance by the personnel affected.

**Other stakeholders** are individuals or organizations who are neither direct users nor owners or customers of the product or service under development, but may have an interest in the development results. In AXMEDIS these other stakeholders include artists, authors, content owners, production and distribution chain managers, production designers, production and distribution chain technicians, marketing professionals, legal experts, distribution partners, researchers, standards bodies, collecting societies, industry associations, sponsors, etc.

Many traditional industries - such as the food or automotive industries - have developed effective and reliable processes to assure that the results of development activities correspond to customer needs. In these industries thorough and disastrous product failures are quite rare today. In established industries the needs of customers, and the criteria according to which they make their choices, are fairly well known, and testing of product quality is securely integrated into the development process. Even the training and education of the developers includes this element. The situation is different in the electronics and software industries where long standing experience does not yet exist, because there is an abundance of new ideas and products. As a consequence a critical reflection of the right approach for user and customer involvement is needed at the initiation of each new project - which we do here for the AXMEDIS project.

## 2.2.2 The specific demands and challenges in the AXMEDIS project

A frequent argument is that innovative technology can not be guided by user- and market-analysis at all, because the prospective users will not be able to answer questions relating to the innovative product before full scale prototypes and the required infrastructure are available and can be demonstrated in full. This is an argument worth taking into account, but the response should be to adapt the approach to this special

challenge, and not to rely on the anticipation of user needs by experts entirely. Experience has shown that the likelihood of error of technology focused expert predictions is quite large, and hopes for grand successes of new products and large markets are often not fulfilled. We regard it as advisable and necessary to apply user centered design principles to innovative development projects.

AXMEDIS is an application oriented RTD project where some of the development activities will be less amenable to precise evaluation than others, but the need to assess the value of the prototype applications and demonstrators with users is still present. The methods used will have to take these specific needs into account.

The specific challenges for user tests in the AXMEDIS project (derived from DoW and D2.1.1) are

- Efficiency of workflow and process
- Cost/benefit and added value
- Usability of a scripting language for content processing
- Usefulness of metadata for information retrieval

Traditional usability evaluation methods focus on the evaluation of the quality of use of user interfaces. New methods may have to be developed for the evaluation of the specific challenges listed above.

### **2.2.2.1 Efficiency of the workflow and process**

The expectations for increased efficiency of the workflow and process can only be realized after relatively large scale implementations have been in operation for a while and users have invested some effort to learn how to use the AXMEDIS tools. The cross-media production and distribution workflow is likely to be a determining factor for user acceptance. This includes the specific issue of Digital Rights Management (DRM), the flexibility of DRM, increased safety and reliability of protection models.

### **2.2.2.2 Cost/benefit and added value**

The AXMEDIS tools and the approach to integrate the tools into the AXMEDIS framework are new, and a considerable amount of technical risk exists. The risk may be reduced by understanding which functionality is of value to users, which functions do users prefer to other functions.

### **2.2.2.3 Usability of a scripting language for content processing**

AXMEDIS is developing a language for scripting rules for processing content. The rationale behind scripts is

- to provide automation of complex and at times repetitive tasks in the content production process
- to adapt the AXMEDIS system to user needs.

What is performed in code has to be similar to what is performed on the authoring side on the GUI of the authoring tools. The question is which is the best way of programming those rules?

### **2.2.2.4 Usefulness of metadata for information retrieval**

Efficient communication of metadata is essential for different groups of users using different types of content (text, images, audio, video, etc.), different types of AXMEDIS objects for different purposes. The opportunity of metadata is high quality (re-)usable content, selectable on the basis of metadata (features, context of use, technical aspects). For composition and formatting metadata play a crucial role. They can help to produce more usable and more accessible content at all levels from editing to fruition. For the

selection of AXMEDIS objects users will exploit available metadata to the maximum. It is evident that dealing with both B2B and B2C environment the metadata set has to be extremely variegated and structured. This is particularly true when taking into account that in the B2B segment we may have to face publishers acquiring content for editing or aggregating, distributors acquiring content for rental, other professional actors acquiring content for different purposes like education, training, advertisement, company image communication. This requires that the object metadata set combines the simplicity of Dublin Core (small number of fields) for an easy search with the complexity of LOM and other metadata sets to ensure proper professional usage at all levels from editing to fruition.

### **2.2.3 Approach and methods**

The approach defines the goals and conceptual background for user validation, while the methods applied to implement the approach are selected from a repertoire to fit the specific parameters of the AXMEDIS project. The general approach for the project is described here. The selection of specific methods will be made when all relevant conditions are known which have to be taken into account, such as the precise question addressed in analysis and testing (which depends on design options), the availability of subjects, and other factors.

Here the main phases of user validation are defined, and a portfolio of the applicable methods is listed which are considered for the project. The user validation plan for the AXMEDIS project is developed on the basis of the format developed in VNET5 and will be updated as needed and as the project progresses. A template for reporting of results is also proposed.

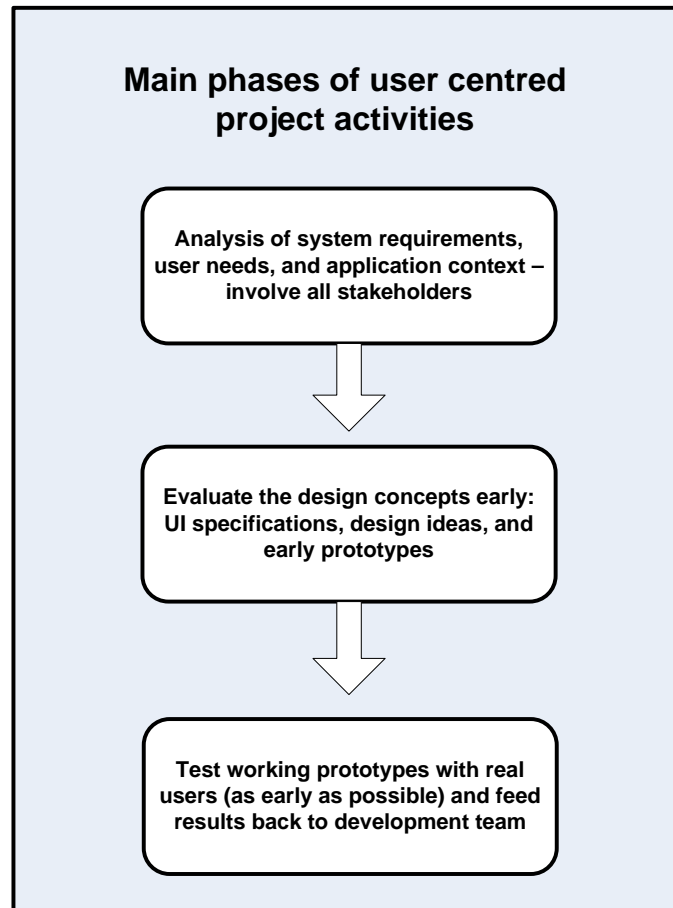
One of the objectives of this user validation approach is to use common methods, and to look for complementary results. Some of the experience may be applicable to other projects (eg take-up actions).

The detailed planning of methods to use, and the commitment to carry out a defined program of user testing and validation is set out in the attached user validation plan. Later we may decide to split this plan into one plan each for each demonstrator and take-up action. The plan is defined in detail up to month 18. The process and methods to follow from month 19 until the end of year 4 will be elaborated by that time, and documented as an extension to this user validation plan. The ability to respond to findings, and the principle of iterative testing and redesign cycles requires that sufficient flexibility is maintained in the process up to the end of the project.

### **2.2.4 The main phases of user centered development**

There are three main phases of user centered design, which correspond to project phases. In all phases the objective of user centered design is to generate information by user analysis which guides the design and development activities.

It is essential that the results of user validation are communicated towards the individuals and groups who are able to use and implement them to improve design quality. (Design refers to the entire software and other relevant features which determine the user experience when interacting with the applications developed, i.e. coverage of functions, graphical and navigation design, and also quality factors such as performance, robustness, learning effort, etc.)



## 2.3 Approach to user validation in AXMEDIS

User validation (including user needs analysis, usability testing, user satisfaction measurement and other methods) is a mature and well documented discipline. For specific domains and development groups the approach and methods to be used are quite well established, and need not be introduced in detail. The issues specific to the AXMEDIS project will be considered and appropriate approaches proposed.

### 2.3.1 Activities in subsequent phases of the project

The common approach to user validation as described at the VNET5 web site ([www.vnet5.org](http://www.vnet5.org)) is representative for the organization of user centered activities in development projects and has been adopted widely. A key property is that the actual process of user validation is tailored for each project in response to the specific goals and parameters of the project.

The following table describes the user validation activities for the AXMEDIS project. User validation is a process running in parallel to other project activities and closely interlinked with the development of the AXMEDIS framework and tools, with the development of demonstrators and, at a later stage, with the take-up actions. The timescales and activities correspond to the current state of planning, but will be updated regularly in response to project progress.

DE4.9.1.3 – The Usability Issues for the AXMEDIS production tools

Activity	Comment	Corresponding AXMEDIS activities / results	Corresponding AXMEDIS timescales
Develop a vision for the application and obtain the support of all stakeholders which will be involved in the project. Agree on the strategic goals of the project.	This is the condition for starting user validation, and the first milestone	Project proposal, DoW	
Collect user needs and requirements, elaborate scenarios of use and use cases, define test cases.	Experienced users and user representatives should be closely involved in this activity, and the results should be critically reviewed (e.g. in user group meetings and workshops)	DE2.1.1a/b User requirements and use cases DE2.2.1 Test cases and content description DE2.3 User group meetings	M1-8
Analyze the context of use of the AXMEDIS framework and tools	Physical, technical, legal, safety, privacy and other requirements and constraints of users are identified.	Platform requirements and constraints, migration and integration aspects (DE2.1.1a)	M1-8 Repeated analysis may be indicated at the time of demonstrator development and at the start of take-up actions.
Define non-functional requirements (quantitative, where possible), taking the expected competitive situation into account. Select applicable measures and benchmarks if possible.		Some non-functional requirements are included in DE2.1.1a.	M1-8
Adopt or develop a style guide.	Minimum requirements are defined in standards for software interface and interaction (e.g. ISO 9241). Platform vendors have developed usability principles, interface and interaction guidelines, most of them are available on the web. Company internal style guides from user partners may be applicable.	See chapters 5.2.1 and 5.2.2 DE3.1.1 Guidelines and specification of research	A decision on the adoption of a style guide has to be made when user interface development activities start.



DE4.9.1.3 – The Usability Issues for the AXMEDIS production tools

Activity	Comment	Corresponding AXMEDIS activities / results	Corresponding AXMEDIS timescales
Perform regular design reviews, inspect and test technical components and first prototypes during the entire development phase.	Initially tests are carried out by the development team or by user interface experts. Only technically sound results should be presented to decision makers and to users - usually this is the case later during the development cycle.	Mock-ups presented to user group and to external experts	M12-18 Usability inspection by users and experts during AXMEDIS project meetings and during the 1 <sup>st</sup> AXMEDIS conference in December 2005
Foresee frequent test & evaluate & redesign cycles. Perform usability inspections of components and first prototypes. User tests are carried out as soon as mature components are available.	The re-design of components as a result of tests which reveal shortcomings must be anticipated.	AXMEDIS Tools (Editors and Viewers, Query Support, Workflow Manager, and other components with user interface developed in WP4).	M12-M18 Usability workshop 1 <sup>st</sup> AXMEDIS conference in December 2005
Inspection, testing, and review of integrated prototype. User tests are carried out as soon as mature prototypes are available.	Critically dependent on the availability of a working prototype.	When the first stable integrated prototype of the AXMEDIS framework is assembled, a user testing workshop will be held where the prototype is inspected and where the user testing methods which will be used subsequently are practiced.	Usability inspection of AXMEDIS Tools by users and experts during AXMEDIS project meetings in March and July 2006.  M18-24: Continuous usability inspection and informal user testing of AXMEDIS Tools (chapter 6 contains the results of this activity)
Update of the requirements with the results from inspection of prototypes with application experts and first tests with selected users.	Partly an informal process. To be documented when important modifications are made.		Continuously until end of year 4.  M18 DE2.1.1.2.1. User requirements, first update DE2.1.1.2.2 Use cases and scenarios, first update DE2.2.1.2 Test cases and content description, first update

DE4.9.1.3 – The Usability Issues for the AXMEDIS production tools

Activity	Comment	Corresponding AXMEDIS activities / results	Corresponding AXMEDIS timescales
Inspection, testing, and review of demonstrators			M18-24 Usability inspection by users and experts during AXMEDIS project meetings in March and July 2006.
User tests of the AXMEDIS demonstrators in realistic application environments. Assessment of workflow and process efficiency and user performance as well as subjective user experience and preferences.	Involve user representatives and real users as soon as stable demonstrators are available. Avoid the introduction of a demonstrator to users as long as uncertainties about the technical maturity of the implementation still exist.		M24-M36
Tests of the AXMEDIS framework and tools as part of Take-Up Actions.	Involve user representatives and real users as soon as stable demonstrators are available. Avoid the introduction of a demonstrator to users as long as uncertainties about the technical maturity of the implementation still exist.		Year 4 To be specified in detail at the end of year 3.
Assessment of the added value and business benefit of specific features of the AXMEDIS framework and tools, of workflow and process efficiency and user performance as well as subjective user experience.	Large-scale trials involving real users should only be initiated when a stable system allowing meaningful productive use is available.		Year 4 Internal trial M37-40 External trial M41-48 To be specified in detail at the end of year 3.

**Milestone results of the user validation activities**

The sequence of activities does not have to be strictly sequential. Four critical and essential milestones should be reached, where the feasibility of the user validation plan should be reviewed.

	Achievement	
1	Common vision of user needs is agreed between development teams, and customer and user representatives	Achieved M6
2	A tested and working initial AXMEDIS framework implementation is completed which has passed expert reviews and informal usability tests.	Expected M18 Achieved M24
3	User tests have indicated workflow and process efficiency, and demonstrated user acceptance and the feasibility of the AXMEDIS framework. They may have indicated further needs for correction of weaknesses, and the potential of the application for introduction as a product.	Expected M36
4	User tests have demonstrated workflow and process efficiency, added value, and user acceptance of the AXMEDIS framework. They may have indicated further needs for correction of weaknesses, and the potential of the application for introduction as a product (incl. Take-up actions).	End of project: M48

Other results, for example requirements documents, are not milestones, because the iterative mode of system development does not define a single point in the project plan where the requirements specifications are fixed. Requirements documents are updated when severe new demands have been identified and need to be communicated.

As a general rule, the development team should test and refine the AXMEDIS software - possibly with the help of experts - until it is satisfied that no further defects exist in the software, and that the quality is likely to meet the expectations of users. Only at that moment should real users be involved. Presenting users with faulty software wastes their time and motivation, and is unlikely to deliver much information beyond the fact that users are not satisfied.

The specific need of assessing user response to process-oriented functionality (workflow) requires that appropriate methods will be developed. These should be available during the field tests in the fourth year of the project.

The elicitation of user requirements and the design reviews and user tests during development are under the responsibility of the development teams (WP4 and WP5), and must be seen as part of the development activity. The role of T4.9 is to set up a user validation plan, to recommend appropriate methods, to inspect initial prototype components and to support the development team and the user partners in the execution of the user validation plan.

The final assessment of the AXMEDIS framework and tools and the data analysis is coordinated by T4.9.

**2.3.2 Evaluation of the usability of a scripting language**

AXMEDIS is developing a language for scripting rules for processing content. What is performed in code has to be similar to what is performed on the authoring side on the GUI of the authoring tools. The question is which is the best way of programming those rules?

The rationale behind scripts is

- to automate complex and repetitive tasks in the content production process
- to adapt the AXMEDIS system to user needs

A script is a list of commands which are executed automatically as if they had been entered one by one by the user. Scripts may also include sequencing instructions such as loops, conditionals, calls to predefined functions and other scripts.

By giving users the possibility of automating and sequencing any series of actions, scripts allow for interaction with the AXMEDIS system at a higher level of abstraction. A complex set of actions can be made an atomic object, which can then be played back at will in different contexts. By writing the appropriate script, a user can for example format all documents that belong to a specific set to be delivered to end-users with a single operation.

A scripting system represents a kind of high-level macro facility, a useful improvement already provided by many applications (office systems, excel, GIS, hypertext).

The objectives (and constraints) should be to bring the benefits of additional programming language features to the AXEMDIS framework and tools which per se is not recognised as a programming language by the users:

- to maintain compatibility of the language for scripting rules with the new AXMEDIS tools and with the language of tools users have been using so far, and
- to maintain the usability advantage. The commercial success of the scripts will be largely due to the fact that users find them more usable than programming languages for programming like tasks.

The analytic approach to the design of a language for scripting rules suggested here is “emphasize the cognitive requirements of end users as a primary design criterion”. This approach is based on recent developments in the study of programming usability which is applicable to the design of languages for scripting rules.

Users use computers to get their work done. Often they are not interested in programming per se. The work of AXMEDIS users, eg content processing, consists of repetitive and complex tasks. Usability is a fundamental concern in AXMEDIS. Therefore a mechanism, the ability to define re-usable abstractions, is needed. Principles from HCI research can be applied to the design of a language for scripting rules. However, it is hard to find practical useful guidance for the design of a language for scripting rules among the research results related to the psychology of programming and from empirical studies of programmers (Brown & Gould, 1987, Corritore & Wiedenbeck, 2000; Dumas & Parsons, 1995; Green, Petre & Bellamy, 1991; Hoadley, Linn, Mann & Clancy, 1996). There is no empirical evidence that usefully informs design decisions for a language for scripting rules for content production and processing. A structured approach to considering human issues in programming which has been used successfully in other recent programming language design projects is the Cognitive Dimensions approach which will be described in chapter 5.2.3.

### **2.3.3 Evaluation of visionary research aimed at breakthroughs as opposed to engineering solutions to defined problems**

It has frequently been stated by leading innovators that there is no need to evaluate highly innovative research results, because demand for them is so obvious and their value for applications is so gigantic, that the only hurdle which has to be taken for success is the ability to deliver the technology. In the face of many instances where these expectations were never fulfilled, this argument should be regarded with suspicion. It is however a fact that it is difficult to foresee the applications for radically new technology, and it does in fact not make sense to insist too early to use innovations for particular applications before the technology is fully developed.

The AXMEDIS framework and tools are developed in a goal directed process, starting from the analysis and specification of requirements, context of use, guidelines and system specification, and added value and cost/benefit targets have been stated in quantitative terms:

- Reduction of the costs of cross media production in the order of 30 % in the production of “automatic content” and for on-demand production, and distribution in the order of 15 %.
- Increased accessibility to content for final consumers (implementation of new services; number of distribution channels and access devices)
- Increased visibility/accessibility of content with P2P tools of AXMEDIS for B2B content sharing
- Increased safety and reliability with protection models
- New business opportunities and higher involvement of SMEs.

### 2.3.4 Analysis of user needs and user requirements

The requirements and needs of users have been analyzed by detailed studies of the application context, based on the involvement of expert users from the AXMEDIS user partners. Needs of users have been elicited in work group meetings and with questionnaires. Further requirements were elicited from expert users in user group meeting.

As part of a systematic requirements analysis in traditional terms the information needs of users have been investigated. Part of this analysis was directed towards the understanding of the role of the AXMEDIS framework and tools in this process, and the expected specific benefit to be derived from the use of AXMEDIS tools.

Some quality criteria of users have been defined at this stage. These are also relevant from the customers’ point of view:

- Efficiency of the workflow and process
- Best coverage of functions (adapted to tasks)
- User friendly GUIs
- Ease of use
- Robustness
- Accessibility
- Visibility

More quality criteria may be relevant. These will be considered in relationship to technical quality criteria for the AXMEDIS framework, and in connection with the assessment of the quality of media content from the user perspective. It may be the case that the quality of some algorithms included in the AXMEDIS framework are neither visible to users, nor of direct concern for them: It may just be the total quality which is assessed by the user.

The approach proposed is to identify the functionality which depends on the new and automatic algorithms and to investigate the value of this functionality according to user assessments elicited by ratings (see discussion of "tradeoffs" below).

### 2.3.5 Assessing components (AXMEDIS tools) and the value of the combined solution (AXMEDIS framework)

The AXMEDIS framework is presented to the user as a package where the quality and benefit of individual tools is not directly visible, and cannot be assessed separately by the user. The underlying functionality and the user interface of the AXMEDIS framework, for example, are not visible as separate tools to the user. An inadequate user interface could make excellent underlying functionality unusable. In some cases it would be desirable to identify both the cause of user dissatisfaction due to the shortcomings of specific tools, and to

identify the value which specific functional components contribute to the perceived value of the entire application, the AXMEDIS framework with integrated tools.

An experimental test of the contribution of individual tools to the performance and quality achieved with the complete framework would be carried out by isolating tools, i.e. by switching certain tools on and off, and comparing user performance and user satisfaction. This procedure only makes sense if the remaining functionality still leaves a fully functional framework. This would be the preferable approach from a methodological point of view, but it may not be possible to implement it.

To separate the value of tool functionality based on the judgments of users in an analytic manner is a challenging task. If the mapping of tools to framework functionality is clear, it may be possible to separate the value of specific functionality to user satisfaction (for example metadata). Provided that the conditions are met, it may make sense to carry out an analysis of user choice and preferences for the separate features and functions of AXMEDIS framework. One critical condition is that a sufficiently large number of users experienced with the AXMEDIS framework can be studied.

It should be noted that the technical performance of system components is measured separately and with different methods, refer to the Measurement Manual (WP5.1) for this issue.

### **2.3.6 User needs and preferences**

The needs of users are not fixed in the sense that precise requirements, constraints, and preferences are maintained under all conditions, but there is a certain amount of "elasticity" such that the user is prepared to trade one attribute for another one. A critical trade-off in complex IT applications is between ease-of-use and learning requirements: It is not possible to make complex procedures simple for the user beyond a certain level without the need for a certain amount of initial learning effort. Some functions may simply be too complex in a given context, and might not provide sufficient value for users and customers. Another critical trade-off can be observed with performance parameters, where speed and accuracy often compete in work processes, and high security often interferes with easy to use interfaces.

The final configuration of the AXMEDIS framework, and the long-term marketing should take these trade-offs into account. If a certain set of functionality is too complex to use, or takes too much learning effort, it must either be simplified in order to become acceptable to users, or excluded in the final version of the AXMEDIS framework. It is possible to study these trade-offs with methods taken from microeconomics and market research, but these methods are applicable only at a stage when the AXMEDIS framework is fairly well developed as a demonstrator or working prototype (in year 2-4 of the AXMEDIS project).

A trade-off analysis is based on the fact that users who have some experience with the AXMEDIS framework are quite capable to answer questions which permit the analysis of user preferences in terms of trade-offs. A meaningful (quantitative) analysis demands that data from a substantial number of representative users are available. If this is not the case, then interviews and rating techniques may allow the collection of data which give an indication of the trade-offs which users consider when selecting products for use and purchase.

Given the high cost of conducting a trade-off analysis, these will be considered towards the later stages of the project where feasible, and if the expected results justify the effort. This would be the case if it appears desirable to know the value of offering specific configurations of AXMEDIS framework to users, and when there are precise hypotheses regarding specific trade-offs.

The guiding question will be to understand the contribution which the use of innovative algorithms and functionality makes to the value offered by the AXMEDIS framework to the user.

The result would allow estimates of the value of adding specific functionality to the AXEMDIS framework, and would indicate which main features users would like to see integrated into the framework.

### 2.3.7 Quality criteria which the users will apply

User validation of the AXMEDIS tools will refer to quality dimensions which are relevant for prospective users. The main dimensions of usability quality which users apply to assess the value of ICT applications are quite well known. Quality dimensions can be measured, however, no measures exist which measure any quality dimension perfectly. The specific quantitative values of these in the particular AXMEDIS context are not known, because quality is not the same for different users, and in a given situation some attributes are more important for a user than others. Therefore it is useful to let users rate the importance of quality dimensions.

A measurement of quality refers to either an object or to a product attribute or feature. For example, performance of a product may refer to the hardware/software, to the skill of the user or to the content provided by the product. A system may be efficient for one task, but not for another. It has become good practice to discriminate between the factors system, user, context and task.

The quality dimensions are usually summarized as

- **Effectiveness** is the ability to actually carry out tasks successfully. **Efficiency** is the cost in terms of time and other factors to carry out the task.
- **Robustness** describes how well a system can cope with user errors (e.g. undo function provided, understandable error messages). **Effort for error correction** describes the cost in terms of time and other factors to recover from errors.
- **Learning effort** required to be able to use a product efficiently. Learning is a function of training and practice. It reduces the cost of task performance for the user. The AXMEDIS tools should be easy to learn so that users can rapidly start getting work done, and they should allow users to reach an acceptable performance level within a specified time. Initial performance is a key quality issue because any user of a system must, at some point, use it for the first time. Training and practice can improve performance continuously. For a good product the performance of mature users should increase considerably.
- **Added value** can be measured by counting the new features offered by a product. The AXMEDIS tools will be of economic value for the customer if the **cost / benefit** relation is positive compared to the traditional way of work. The added value of professional and commercial systems usually is increased productivity and the ability to execute work processes faster, more flexibly and with higher quality. However, economic value for the customer need not be added value for the user. From a users point of view the added value can be improved quality of life.
- **Integration into a product family and migration.** Many software products enter the market as part of product families (e.g. Microsoft Office), have a corporate identity, common look and feel, run on the same platform. The integration of a new product can be achieved through consistency of all components with existing products. This will save the customer cost for training. For the user the advantage of using an integrated product will be reduced learning effort through transfer of knowledge. If the user knows already how to operate products of a product family, it will be easier to use another product of that family due to consistent dialogue structures. From the user point of view consistency is highly desirable. Producing consistency requires an extensive program of agreed styles for common appearance, structure, navigation and other features. Guidelines, standards and tests for consistency.

- **Subjective assessment** (affect) of the quality of the AXMEDIS tools by users. Positive user experience, user satisfaction with a product and acceptance of a product is important for market success. (Measurement results for efficiency, effectiveness, and user satisfaction may differ!)

A more detailed discussion of quality factors which describe "quality of use" can be found at [www.VNET5.org](http://www.VNET5.org). For the various quality factors there are measurement instruments available (such as checklists, questionnaires, rating procedures, experiments etc) which can be selected such that the best and most cost-effective method is used for any given project. The choice of appropriate methods depends upon business objectives, quality objectives, and project constraints.

The preferred approach in human-computer interaction is to let users carry out defined tasks, with a defined objective and end point, under controlled conditions, and to measure user behaviour quantitatively. This may be complemented by the measurement of subjective user assessments. The proven and widely used methods for usability evaluation and user assessment do, however, not include means to measure added value and integration into product family and provide no means for the evaluation of the specific challenges for the AXMEDIS project. To measure these quality factors, new methods have to be developed.

### 2.3.8 Benchmarking and business benefit

Benchmarking of new products against established or competitive ones is the essential indicator for the likely success of the product on the market. It guides management decisions on future investment, marketing, and regarding the direction of further development effort (including the exploitation of research results). Benchmarking relies on a systematic comparison of system features according to the criteria which the future users and customers will apply. While established products must make sure that they do not show deficits in respect to new competitors, new competitors must demonstrate clear advantages and benefits in comparison with existing products. In addition, benchmarking helps to indicate the strengths of new applications, and to identify the most promising application domains and markets.

In the case of AXMEDIS, we can benchmark the production process today, or before AXMEDIS, but it would be interesting (also for exploitation reasons) to research other collaborative production tools.

The measures of user performance employed for user testing are applied, in addition to an estimate of the business benefits in quantitative terms (cost, speed etc), and non-monetary terms (quality, image, attractiveness). The result is either an estimate of the total cost of the business processes analyzed under different conditions. The most critical condition for meaningful benchmarking is the right choice of standards and comparable systems to test against. Selecting appropriate competitive solutions will be a challenge for AXMEDIS as the nature of the project is to create a unique framework that does not face simple equivalent competition. More likely, the choice of benchmarks to compare AXMEDIS benefits would need to come from a combination of different production tools, collaborative tools and content management solutions. This kind of competitive benchmarking will be explored, but may not provide sufficiently robust evidence at this stage of the market to be of use to AXMEDIS.

Assessment of business benefit is the attempt to quantify the benefit for the customer in relation to the total cost of ownership. This process is simpler than the benchmarking of competing solutions, as it simply benchmarks the cost-benefits of AXMEDIS introduction versus the status quo, or "do nothing" scenario. The results should provide basic parameters to explain the value of the introduction of AXMEDIS technology in terms of return on investment. This is a standard approach in market research and product strategic planning. It will be applied in a selective manner to the most critical aspects of AXMEDIS framework and tools. The results should be among the main arguments presented to users and customers for the uptake of the new technology.

The procedure which we suggest to use for benchmarking can be outlined as follows:

- Identify the main business processes.



- Estimate the high-level process cost for the key processes.
- Estimate the high-level value added by each process in order to model the value chain.
- Provide comparative estimates for alternative and competing applications (at minimum, the ‘do nothing’ scenario, ie. the costs before introduction of AXMEDIS).
- Identify the non-monetary benefits, and rank the value of these for the owner of the system.

The result gives an estimate of the total cost of the application, and allows cost versus benefits sample calculations for future deployments of the technology in comparison with alternatives.

In addition to cost estimates based on total cost of ownership, an investigation into non-monetary cost, benefits, and constraints (such as privacy, traceability of decisions, DRM, etc), can be carried out for the user partners / demonstrators. The information used in these investigations will be derived from users of the AXMEDIS framework and tools, who can supply details about desirable and useful features and properties of the new applications which they have been using. The information supplied by users becomes more realistic after demonstrators have been available for field trials.

An approach for AXMEDIS about the level of detail required in cost analysis, the differences between differing content forms and distribution networks, and also the value add of reselling to new channels will be proposed in chapter 5.5.

The analysis of the business benefits is done in order to provide quantitative parameters and arguments for the adoption of AXMEDIS technology. For this purpose the application processes which can benefit most will be indicated, and the strategic objectives which are served.

A number of steps are carried out in sequence to arrive at an analysis of the business benefit of new information services:

1. Define the tools which will be produced, and their potential impact on the modification of business processes.
2. Analyze the competitive situation. Both existing and future tools are taken into account.
3. Develop a cost model which focuses on process cost estimates for the most frequently executed user processes, including realistic estimates of personnel cost and training cost.
4. Assess the strategic benefits. This is done by scoring and relative rating by strategic planning experts from the foreseen user organizations. The data obtained are ratings rather than objective measures.
5. Produce weights for the cost factors and the strategic objectives and calculate results.

The cost estimates for specific processes (such as composing specific types of objects, searching for a specified set of objects in the data base) can be fairly precise. The strategic benefits are only represented by momentary rating scores with a strong subjective basis, and can only be interpreted as such. The value of such ratings is therefore critically dependent upon the participation of the decision makers who will in the end make the decisions on the basis of the available data.

A factor to be considered will be the risks and requirements associated with the introduction of new technology, and the learning cost for the personnel and the organization affected.

In the next chapter 5 the methods which we propose for adoption up to month 18 are presented in detail. A workshop with representatives from all user partners will be conducted when initial integrated prototypes of the AXMEDIS tools are available. A coordinated procedure will be agreed among all participants and set into practice by using common materials.

## **2.4 Methods**

A sizable portfolio of methods for user tests and validation with similar aims, but different strengths and weaknesses exists for practical implementation of the approach outlined above. Rather than deciding early on particular methods, we consider it better to be open to select the most appropriate methods for the research questions at hand when all the constraints for the AXMEDIS tools, demonstrators, take-up actions have been identified in full.

We discuss the applicable methods for the AXMEDIS user validation and the topics where some work has to be done to extend or adapt methods. The user validation plan in the appendix lists the relevant parameters and constraints which suggest the choice of the methods for user validation. This is not a fixed plan for execution. It represents the set of preferred options among which a choice according to the constraints at the time of testing can be made.

The elaboration of additional methods to be used for user validation in the test of demonstrators, and for business benchmarking after the first 18 months, are subject of the work carried out in the years 2 to 4.

### 2.4.1 Requirements analysis phase

The results of the requirements analysis phase primarily provide input for the developers, but are also closely linked to user validation because the user tasks for testing (test cases) and the evaluation criteria are derived from the requirements. Requirements are also subject to testing, because documented requirements may deviate significantly from the actual requirements which users apply in their productive use. As a consequence the documented requirements do not become fixed, but will be updated with feedback and comments from the expert user group and as experience with the new AXMEDIS tools is collected in increasingly realistic settings.

Because of the innovative character of the AXMEDIS tools the emphasis was placed upon a thorough and profound understanding of the application context, and experienced domain experts from the AXMEDIS user partners are available who are able to inform the development team about all relevant aspects which will determine the acceptance by users.

Appropriate approaches to requirements analysis have been used in the first 6 months of the project (scenarios in narrative form with diagrams and use cases). These results have been tested with the user partners and a group of external expert users. Further user group meetings are planned.

The WP2 activities have analyzed the context of use to a considerable extent:

- User groups and roles were identified.
- Traditional and desired workflow procedures were described on a high level.
- Technical environments implemented at the premises of the user partners were described.
- Functional requirements of users were defined in detail (DE2-1-1a/-User-requirements and Use-Cases)
- Some non-functional requirements are more implicitly included in DE2-1-1a: eg. user friendly interface, easy to use, faster to use, robustness, best coverage of functions.

Non-functional requirements include the description of user characteristics such as prior knowledge and experiences, special needs, subjective preferences of users and customers and the description of the work environment. Further non-functional requirements must be derived from cost constraints. Non-functional requirements should be studied in more detail.

One focus of user-centred development is on minimising the risk through the development process. Risks can be reduced by understanding the different segments of the customer base. An in-depth analysis of the context of use will help to manage the risk to fail, because the context of use tells us who is going to use the product, what for, and under what circumstances. Innovative products must first be adopted by niche customers who find the product a total solution to their specific needs.

The physical and organizational context in which a product will be used represents a large number of constraints. Many of these are not spectacular issues, but have to be kept in mind when a new product is developed, because minor oversights and omissions can create considerable cost and delays at a later stage.

The concept of " Context of Use Analysis " maintains that the usability of a product is affected not only by the features of the product itself, but also by the characteristics of the users, the tasks they are carrying out, and the technical, organizational and physical environment in which the product is used. Context includes all factors which affect the usability of the product, excluding the functionality of the product itself. For practical purposes only parts of the analysis can be carried out and documented.

Context of Use Analysis is a structured technique for eliciting this information about the context in which a product will be used. The results are descriptions of

- characteristic groups of prospective users
- the tasks different groups of users intend to perform with the product
- the organizational and physical environments in which the product will be used.

This information will be collected with a Context of Use Questionnaire from the AXMEDIS user partners and maybe other potential customers. These data will be used to draw up profiles of the user groups. We also need to understand users' goals, needs and values. Users have lots of needs, some of them are more important (and more profitable to serve) than others. The aim is to spot product opportunities.

## **2.4.2 Usability inspection and user tests in the development phase**

In the initial development standards and user interfaces guidelines for the design of information presentation and navigation structures, and samples which illustrate these, are highly effective. When used in a more rigorous form, style guides must be complemented by an inspection and review process which tests for the adherence to the guidelines. This is usually done by expert review - but not to be carried out by the developers themselves.

Inspection and design reviews during the early development phase should be carried out by system experts who are not involved in the development effort. They use checklists and test the system according to the defined use cases, assuming the role of a user. They report the results directly to the developers, and possibly involve the developers directly in the design review.

Effective methods are heuristic evaluation and cognitive walkthrough, where test experts systematically follow scenarios and use cases to exercise the system. This may be done in approximate form even with paper prototypes and specifications. The number of defects found is expected to be initially quite large. Experience shows that the less mature an implementation is, the faster will defects be found. Different expert evaluators, however, do not find the same defects, and not in the same order of sequence. It is therefore advisable to use two or three test experts to evaluate a design. In later development stages longer test sessions should be foreseen.

### **2.4.2.1 Relevant Standards**

Agreed formal standards provide only a minimum quality requirement, but are a useful reference against which to compare new applications.

Organizations with a certified quality system such as ISO 9000 will usually have references to user interface development standards in their quality system. The procedures used, and the documentation standards should

correspond to the quality system (which would also make procedures most efficient). A common requirement is the documentation of the tests which were carried out, and of the test results obtained.

This section provides a quick reference to the most important standards related to usability and user-interfaces.

Poorly designed user interfaces may cause problems and difficulties for the user. The objective of the **European Directive 90/270/EEC on minimum health and safety requirements for work with display screen equipment** is to prevent that health hazards are generated for workers and employees through the use of display screen units. The directive applies to display screens, regardless of the technology used, and workstations, which are defined as assemblies comprising display screen equipment, input devices, software and interfaces. The directive is addressed at employers and employees and to their representatives, and also to manufacturers and distributors of hardware and software. The principles are:

- Software must be suitable for the task.
- Software must be easy to use and, where appropriate, adaptable to the user's level of knowledge or experience. No quantitative or qualitative checking facility may be used without the knowledge of the workers.
- Systems must provide feedback to workers on their performance.
- Systems must display information in a format and at a pace which are adapted to users.
- The principles of software ergonomics must be applied, in particular to human-data processing.

The European Directive overlaps to a considerable degree with part 110, Dialogue Principles, of the **ISO 9241 The ergonomics of human system interaction** (previously called: Ergonomic requirements for office work with visual display terminals) and has been implemented in various ways in the member states as legislation relating to safety at work and accident prevention.

The European Directive is relevant for ICT products which are used at work. The main mechanism for testing the compliance of an application with the European Directive is the obligation of the employer to check and analyze that workplaces are not in conflict with these requirements. It is advisable that developers and vendors take into account the needs and requirements of their users and customers to comply with the European Directive in their application.

The software ergonomic qualities are not measurable by accepted objective measurement procedures. The current state of the art is the target against which the ergonomic quality of an application will be measured. Checklists which contain all relevant items are used for this purpose. It is also obvious that the level of quality of applications is evolving, and that the demands of customers and users are rising accordingly.

**ISO 9241 part 151 Software ergonomics for World Wide Web user interfaces (was ISO 23973 Web Usability Standard)** uses a reference model for web design comprising design, process and evaluation. The Standard itself is focused on the design domain aspects only. These are: purpose and strategy, content and functionality, navigation and interaction, and presentation and media design. These aspects can be seen as different levels of the overall design process.

The other two parts of the model represent the process domain and the evaluation domain. These constitute important aspects for the user-centred development of Web applications but they are not elaborated in this International Standard.

**ISO 9241 part 200 Human system interaction processes (was ISO 13407 Human Centred Design for Interactive Systems)** provides the framework for the design process. The principles of a human-centred process are:

- Active involvement of users (or those who speak for them) and clear understanding of user and tasks requirements.
- Appropriate allocation of function (making sure human skill is used properly)

- Iteration of design solutions (therefore allow time in project planning)
- Multi-disciplinary design (but beware over large design teams)

Active involvement of users and clear understanding of user and task requirements is taking place with regard to the professional users of the AXMEDIS framework and tools. Active involvement of end users must be seen as a challenge because not all potential groups of users are known in advance and the requirements and preferences of these potential groups of users concerning the AXEMEDIS system are not known.

Iteration of design solutions is implemented in AXMEDIS, some iterations have been done, for example:  
Creation of usage scenarios → Validation and feedback by expert users → Improvement of scenarios  
Creation of early prototypes → Validation and feedback by expert users → Amendment of prototypes.

Multi-disciplinary design is implemented in AXMEDIS, where partners with various relevant expertise are involved, for example computer scientists, legal experts, domain experts (the user partners) and usability experts.

The standard also recommends four key human-centred design activities:

- Understand and specify the context of use (make it explicit: avoid assuming it is obvious)
- Specify user and organisational requirements (there will be a variety of different viewpoints and individuality)
- Produce design solutions (plural, multiple designs encourage creativity)
- Evaluate designs against requirements (involves real user testing not just convincing demonstrations).

More specific guidance can be found in

- **ISO/IEC 9126 parts 2 and 3 contain criteria for the evaluation of user interfaces**
- **ISO 14915 and IEC 61997 contain recommendations for multi-media interfaces**
- **ISO 10741 Dialogue Interaction**
- **ISO/IEC 11581, Icon symbols and functions**
- **ISO/IEC FCD 18021: Information Technology - User Interface for mobile tools (2001)**
- **ISO 9241 part 171 Guidance on software accessibility (was ISO 16071)**
- **ANSI/HFES-200-199x - Ergonomic Requirements for Software User Interfaces**

### **2.4.2.2 User Interface Design Principles and Style Guides**

Style guides containing user interface design principles are described in documents, and often are also embedded in user interface toolkits. In addition to general style guides, which propose good practice in user interface design and suggest a common style, there are style guides for users with special needs and non-PC devices (eg. at [www.w3c.com](http://www.w3c.com)). For the basic design for alternative access devices a search among the most recent style guides for non-PC devices will be performed. Several general style guides which are available online are summarized below and the corresponding links are provided with the references.

#### **Apple Computer, Inc. Macintosh Human Interface Guidelines**

**Metaphors:** Take advantage of people's knowledge of the world by using metaphors to convey concepts and features of your application. Use metaphors that represent concrete, familiar ideas, and make the metaphors obvious, so that users can apply a set of expectations to the computer environment. Metaphors should suggest a use for a particular element, but that use does not have to limit the implementation of the metaphor. It is important to strike a balance between the metaphor's suggested use and the computer's ability to support and extend the metaphor. For example, the number of items a user puts in the Trash is not limited to the number of items a physical wastebasket could hold.

**Explicit and Implied Actions:** In the first step of a manipulation, the user sees the desired object on screen. In the second step, he selects or designates that object. In the final step, he performs an action, either using a menu command or by direct manipulation of the object with mouse or other device. This leads to two paradigms for manipulating objects: explicit and implicit actions:

- Explicit actions clearly state the result of manipulating an object. For example, menus list the commands that can be performed on the currently selected object. Explicit actions do not require the user to memorize the commands that can be performed on a given object.
- Implied actions convey the result of an action through visual cues or context. A drag-and-drop operation is a common example of an implied action. For implied actions to be apparent, the user must be able to recognize the objects involved, the manipulation to be performed, and the consequences of the action.

**Direct Manipulation:** Make users feel they are controlling the objects represented on the display. An on screen object should remain visible while a user performs an action on it, and the impact of the action should be immediately visible. For example, with drag-and-drop users can move a file by dragging its icon from one location to another.

**User Control:** Allow the user to initiate and control actions. Use progressive disclosure to present users with the most appropriate actions but offer alternatives when they exist. The key is to provide users with the capabilities they need and at the same time to provide warnings to avoid irreversible actions (for example the deletion of data by accident).

**Feedback and Communication:** Keep users informed about what's happening. Provide appropriate feedback, for example that user input was received and is processed. Use a progress indicator for lengthy operations. Provide feedback in a direct, simple and understandable way. Error messages should be precise. For example "There's not enough space on the disk to save the document") and possible actions the user can take to rectify "Try saving the document in another location".

**Consistency** in the interface allows users to transfer their knowledge and skills from one application to another. What You See Is What You Get (WYSIWYG). Where users can format data for printing, publishing to the web, or writing to film, DVD, or other formats, make sure there are no significant differences between what users see on screen and what they receive in the final output, or use a preview function if necessary.

**Forgiveness:** Encourage people to explore your application by building in forgiveness, by making most actions easily reversible. People need to feel that they can try things without damaging the system or jeopardizing their data. Anticipate common problems and alert users to potential side effects.

**Perceived Stability:** To give users a conceptual sense of stability, the interface should provide a clear, finite set of objects and set of actions to perform on those objects. For example, when a menu command does not apply to a selected object or to the object in its current state, the command is dimmed rather than omitted. To help convey the perception of stability, preserve user-modifiable settings such as window dimensions and locations. When a user sets up his or her environment to have a certain layout, the settings should stay that way until the user changes them. Providing status and feedback also contributes to perceived stability by letting users know that the application is performing the specified task.

**Aesthetic Integrity:** Information should be well-organized and consistent with principles of good visual design. Your product should look pleasant on the screen, even when viewed for a long time. Keep graphics simple, and use them only to enhance usability. Do not overload windows and dialogues with icons or buttons. Arbitrary symbols to represent concepts may confuse or distract users. Match a graphic element with a user's likely expectations of its behaviour. Do not change the meaning or behaviour of standard items.

**Modelessness:** Avoid using modes that lock users into one operation and prevent them from working on anything else until that operation is completed. If an application uses modes, there must be a clear visual indicator of the current mode, and it should be very easy for users to get in to and out of the mode. For example, in many graphics applications, the pointer can look like a pencil, a cross, a paintbrush, or an eraser, depending on the function (the mode) the user selects.

### **IBM Corporation. Object-Oriented Interface Design: IBM Common User Access Guidelines**

**Simplicity: Don't compromise usability for function.** Keep the interface simple and straightforward. Basic functions should be immediately apparent, while advanced functions may be less obvious to new users.

**Support: Place the user in control and provide proactive assistance.** Give users control over the system. Enable them to accomplish tasks using any sequence of steps that they would naturally use. Do not limit them by artificially restricting their choices to your notion of the "correct" sequence. Ideally, assistance should provide users with knowledge that will allow them to accomplish their tasks quickly.

**Familiarity: Build on users' prior knowledge.** Allow users to build on prior knowledge, especially knowledge they have gained from experience in the real world. A small amount of knowledge, used consistently throughout an interface, can empower the user to accomplish a large number of tasks.

Avoid the tendency to employ consistency without understanding your users, their tasks, and their shared experiences. When choosing a dimension within which to be consistent, seek to understand what the user expects and be consistent with those expectations. Providing a familiar experience is the ultimate use of consistency in which a truly intuitive interface will result.

**Obviousness: Make objects and their controls visible and intuitive.** Use real-world representations in the interface. Real-world representations and natural interactions (direct action) give the interface a familiar look and feel and can make it more intuitive to learn and use. Icons and windows were early attempts to draw on user experiences outside the computing domain. The controls of the system should be clearly visible and their functions identifiable. Allow users to interact directly with objects and minimize the use of indirect techniques.

**Encouragement: Make actions predictable and reversible.** A user's actions should cause the results the user expects. In order to meet those expectations, the designer must understand the user's tasks, goals, and mental model. Users should feel confident in exploring, knowing they can try an action, view the result, and undo the action if the result is unacceptable. Users feel more comfortable with interfaces in which their actions do not cause irreversible consequences. Even seemingly trivial user actions, such as deselecting or moving objects, should be reversible. Avoid bundling actions together, because the user may not anticipate the side effect.

**Satisfaction: Create a feeling of progress and achievement.** Allow the user to make uninterrupted progress and enjoy a sense of accomplishment. Reflect the results of actions immediately; any delay intrudes on users' tasks and erodes confidence in the system. Immediate feedback allows users to assess whether the results were what they expected and to take alternative action immediately. For example, when a user chooses a new font, the font of all applicable text, or of sample text, should change immediately. The user can then decide if the effect is what was desired and, if not, can change it before switching attention to something else.

**Availability: Make all objects available at all times.** Users should be able to use all of their objects in any sequence and at any time. Avoid the use of modes, those states of the interface in which normally available actions are no longer available, or in which an action causes different results than it normally does.

**Safety: Keep the user out of trouble.** Protect them from making errors. Eliminate the opportunity for user error and confusion. The burden of keeping the user out of trouble rests on the designer. The interface should

provide visual cues, reminders, lists of choices, and other aids, either automatically or on request. Contextual and hover help, as well as agents, can provide supplemental assistance. Users should never have to rely on their own memory for something the system already knows, such as previous settings, file names, and other interface details. If the information is in the system in any form, the system should provide it. Two-way communication may be necessary at times to allow users to clarify or confirm requests, or to remedy a problem, and may be used to help users reach their goals.

**Versatility: Support alternate interaction techniques.** Allow users to choose the method of interaction that is most appropriate to their situation. Interfaces that are flexible in this way are able to accommodate a wide range of user skills, physical abilities, interactions, and usage environments. Providing a range of interaction techniques recognizes that users are individuals with different abilities and situations. The differences include disabilities, preferences, and work environments.

**Personalization: Allow users to customize.** The interface should be tailored to individual users' needs and desires. Customization can help make an interface comfortable and familiar for a user. In an environment where one user may be using several computers, or another environment with many users with different "profiles", personalization will be a mean to tailor to the needs of each single user.

**Affinity: Bring objects to life through good visual design.** The goal of visual user interface design should be to develop an intuitive and familiar representation that is second nature to users. The following visual design principles promote clarity and simplicity in the interface:

- Subtractive design - reduce clutter by eliminating any visual element that doesn't contribute directly to visual communication.
- Visual hierarchy - by understanding the importance of users' tasks, establish a hierarchy of these tasks visually. An important object can be given extra visual prominence. Relative position and contrast in colour and size can be used.
- Affordance - when users can easily determine the action that should be taken with an object, that object displays good affordance. Objects with good affordance usually mimic real world objects.
- Visual scheme - design a visual scheme that maps to the user model and lets the user customize the interface. Do not eliminate extra space in your image just to save space. Use white space to provide visual "breathing room."

### **Microsoft Corporation. The Windows Interface Guidelines for Software Design: An Application Design Guide**

**User in Control** of the software. The user plays an active rather than reactive role. Because of widely varying skills and preferences, users should be able to personalize interfaces. Software should be as interactive and responsive as possible. Avoid modes where possible.

**Directness.** Software should be designed such that users can directly manipulate software representations of information. Familiar metaphors provide a direct and intuitive interface for user tasks. By allowing users to transfer their knowledge and experience, metaphors make it easier to predict and learn the behaviours of software-based representations. Metaphors support recognition rather than recall. Meanings associated with familiar objects are remembered more easily than command names.

**Consistency** allows users to transfer existing knowledge to new tasks, learn new things more quickly, and focus attention to tasks. Consistency should be designed into an application, the operating environment, into metaphors.

**Forgiveness.** Users like to explore an interface and often learn by trial and error. An effective interface allows for interactive discovery and that users make mistakes. Effective design avoids error prone situations. It also accommodates potential user errors and makes it easy for the user to recover.



**Feedback** to user's actions helps confirm that the software is responding to user input and communicates details that distinguish the nature of the action. Effective and good feedback is timely and presented close to the users interaction.

**Aesthetics.** Visual design is an important part of an application's interface. Visual attributes provide valuable impressions and communicate important cues to the interactive behaviour of particular objects.

**Simplicity.** An interface should be simple (but not simplistic), easy to learn, and easy to use. It must also provide access to all functionality of an application. Maximizing functionality and maintaining simplicity work against each other in the interface. An effective design balances these objectives and is one of the purposes in defining project guidelines. Simplicity also correlates with familiarity; things that are familiar often seem simpler. Whenever possible, try to build connections that draw on your users' existing knowledge and experiences.

### Web Content Accessibility Guidelines

The Web Content Accessibility Guidelines explain how to make web content accessible to people with disabilities. The primary goal of these guidelines is to promote accessibility. Following them will also make web content more available to all users, whatever user agent they are using (e.g., desktop browser, voice browser, mobile phone, personal computer, etc.) or constraints they may be operating under (such as noisy surroundings, under- or over-illuminated rooms, in a hands-free environment, etc.). Following these guidelines will help people find information on the web more quickly. These guidelines do not discourage content developers from using images, video, etc., but rather explain how to make multimedia content more accessible to a wide audience.

### Other relevant guidelines

Other relevant guidelines may be those of Sun Microsystems for Java and Open Look, those of the Open Software Foundation, and principles and techniques to enhance the visual quality and usability of products described by Mullet & Sano (1995).

Company-internal style guides from AXMEDIS user partners may be applied where applicable. These issues were addressed in detail in the AXMEDIS deliverable DE3.1.3 Content selection guidelines, in the context of content rather than applications.

### Relevant principles for AXMEDIS User Interface Design

The design principles presented in the previous chapters have much in common and share a user-centred approach. The table below shows the overlap of the three most relevant UI design guidelines.

Apple	Microsoft	IBM
Metaphors	Directness	Familiarity: Build on users' prior knowledge  Obviousness: Make objects and their controls visible and intuitive
Direct Manipulation	Directness	
User Control	User in Control	Support: Place the user in control and provide proactive assistance
Perceived Stability		Personalization: Allow users to customize
Modelessness	User in Control	Personalization: Allow users to customize
Modelessness		Availability: Make all objects available at all times
Feedback and Communication	Feedback	
Consistency	Consistency	Familiarity: Build on users' prior knowledge

Forgiveness	Forgiveness	Safety: Keep the user out of trouble
Forgiveness	Forgiveness	Encouragement: Make actions predictable and reversible
Aesthetic Integrity	Aesthetics	Affinity: Bring objects to life through good visual design
Aesthetic Integrity	Simplicity	Simplicity: Don't compromise usability for function
		Satisfaction
		Versatility
Explicit and Implied Actions		

The most important concepts of the presented guidelines are summarized here to be considered for design and development of the AXMEDIS framework and tools:

- **Be consistent.** Consistency should be maintained across multiple platforms, operating systems, AXMEDIS tools. Users may need to switch between tools. Consistency is also achieved by creating device independent I/O methodologies.
- **Provide shortcuts** for frequent users. This rule takes into account the need for simplicity and user control with personalization. Time is often critical for AXMEDIS users. Reducing the number of operations needed to perform tasks with scripts and/or macro functionality is a key factor to increase efficiency.
- **Design for error recovery.** Error prevention and simple error handling, for example Undo functions, are essential.
- **Informative feedback.** The tools should offer informative feedback to establish a communication with the user.
- **Personalization.** Users differ with respect to the set of tasks they have to perform, skill levels, usage patterns, preferences. Users like a personal view of the application: specific colors, fonts, arrangement of icons on the desktop.

**Multilingualism** is another relevant issue. The AXMEDIS framework and tools will facilitate work across national, linguistic, and cultural boundaries and is intended to be installed all over Europe, where different languages and cultures are joined with the same idea in mind. We have to cope with the fact that not all AXMEDIS users will be familiar with the English language.

A number of additional factors may affect the design of AXMEDIS tools from technical requirements, legal requirements, to the requirements of different groups of users. The AXMEDIS project aims to integrate tools in a framework to make work tasks more efficient and effective. A challenge for developers is how to address tools that can be accessed through a variety of terminals, platforms with a number of different CMS, and that may vary in terms of interaction resources (screen size, processing power, CMS, platform).

There is no simple solution when a design trade-off occurs. For usability inspection the following factors should be considered:

- Additional features may affect user performance, complexity, stability, maintenance, and support costs.
- Simplicity is not the same as simplistic. Making the user interface simple to use is often hard work.
- Security may interfere with usability. AXMEDIS should provide a secure execution context to ensure IPR and copyright.

### 2.4.2.3 Cognitive Dimensions

The Cognitive Dimensions framework (Li, Grundy, Amor & Hosking 2002; Beckwith, Burnet & Cook, 2002; Burnett, Arredondo-Castro & Atwood, 2002) is supposed to help developers to assess the usability of a language for scripting rules at design time. The benefit lies in having an explicit list of design attributes – summarizing empirical evidence about programming language or environment attributes important to human problem solving - which can be checked and referred to throughout the design project.

This analysis can be carried out on its own or as part of a usability inspection described in the next subsection.

Design principles	How to check whether design principles have been taken into account
Abstraction gradient	What are the minimum and maximum levels of abstraction? Can fragments be encapsulated?
Consistency	When some of the language has been learnt, how much of the rest can be inferred?
Error-proneness	Does the design of the notation induce ‘careless mistakes’?
Hidden dependencies	Is every dependency overtly indicated in both directions? Is the indication perceptual or only symbolic?
Premature commitment	Do programmers have to make decisions before they have the information they need?
Progressive evaluation	Can a partially-complete program be executed to obtain feedback on “How am I doing”?
Role-expressiveness	Can the reader see how each component of a program relates to the whole?
Viscosity	How much effort is required to perform a single change?
Visibility and juxtaposability	Is every part of the code simultaneously visible (assuming a large enough display), or is it at least possible to compare any two parts side-by-side at will? If the code is dispersed, is it at least possible to know in what order to read it?

### 2.4.2.4 Usability Inspection

Usability inspection is not user testing. It is an activity based on rigorous testing procedures carried out by experts. The scope of inspection is to identify severe defects in application design and usability problems, to detect the nature of these problems and to suggest recommendations for possible solutions.

Usability inspection is applied best in the early phases of the development process when mock-ups or prototypes of a new application are available. Usability inspection follows similar principles as code inspection for the assurance of minimum quality of a software product (assuring that it works as specified, and corresponds to the minimum quality requirements plus additional ones which were specified, for example the adherence to style guides, standards - including internal requirements).

The general process is the following:

- Recruit inspectors (usability experts)
- Pre-evaluation training to familiarize the experts with the objectives of the inspection
- Several experts inspect a mock-up or prototype, simulate the performance of tasks, and record defects and usability problems.
- After the inspection the collected data are elaborated and the severity of usability problems is rated.

- Finally the results and recommendations for improvement are communicated to the development team.

The main benefits of inspection are that it is cost-effective because no test users are needed and that it can serve as a preparatory phase for a more focused user testing. Certain tests- such as the adherence to styles - can not be carried out with users. These require inspection methods to be carried out by experts who are familiar with the implementation of the styles required.

Several types of inspection methods are suggested:

- Heuristic Evaluation
- Cognitive Walkthrough
- Pluralistic Walkthrough
- Formal Usability Inspection

Heuristic Evaluation has been developed and applied systematically by Jacob Nielsen (1994), who has derived 10 usability heuristics from a factor analysis of 249 usability problems. Heuristic evaluation based on these principles can be regarded as a very well founded method, which is supported by a number of empirical studies about its effectiveness. The usability heuristics are (Nielsen 1994, p. 30).

1. *"The system should always keep users informed about what is going on, through appropriate feedback within reasonable time."*
2. *"The system should speak the users' language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order."*
3. *"Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo."*
4. *"Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions."*
5. *"Even better than good error messages is a careful design which prevents a problem from occurring in the first place."*
6. *"Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate."*
7. *"Accelerators - unseen by the novice user- may often speed up the interaction for the expert user to such an extent that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions."*
8. *"Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility."*
9. *"Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution."*

10. *"Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focussed on the user's task, list concrete steps to be carried out, and not be too large."*

Ideally 3-5 evaluators inspect the user interface systematically with regard to these basic heuristics describing the characteristics of usable interfaces. The inspection takes 1-2 hours depending on the size of the application. The evaluators examine the interface and judge its compliance with the recognised usability principles (the heuristics). After the inspection the evaluators elaborate and summarize the problems they have found. In a debriefing session the results from all inspectors are discussed and aggregated, and the severity of the defects and usability problems is rated.

The severity of usability problems may vary:

- No user would have problems; Some users might have difficulties; Most users would have problems
- Frequency with which a defect or problem occurs: Always, often or rarely
- Impact of the defect or problem if it occurs: Easy or difficult for users to overcome the problem

The result of the debriefing session will be a list of defects and usability problems ordered according to severity, and recommendations for improvements.

The process of carrying out one of the other inspection methods (Cognitive or Pluralistic Walkthrough, Formal Usability Inspection) is similar to Heuristic Evaluation, except that these alternative inspection methods also include users, domain experts and developers and instead of the 10 heuristic evaluation principles other guidelines and more formal rules for carrying out the inspection are used.

It is important to be aware of the fact that inspection methods will render a decreasing number of defects as testing continues. In addition, different inspectors do not home in on quite the same set of defects. It is essential therefore is to use several inspectors.

In the initial testing cycles both a larger number of problems, and more severe defects will be found. It does not make sense to be exhaustive in the initial tests, but to focus on a sound assessment of the major defects, and on the formulation of the change requests handed to the development team. In the next test cycle a somewhat different set of defects will be identified, and the severity of defects found will decrease at the same time as the visible quality of the solution improves. (At this stage it makes sense to think about the involvement of users, who should be tested only with a reasonably stable application which allows them to carry out some tasks successfully.)

A workshop will be held to introduce members of the development teams to user interface guidelines and inspection methods applied in the early phases (AXMEDIS conference, Florence, 2 December, 2005).

### **2.4.3 Field trials and acceptance test**

Users who are presented with incomplete and defective software become frustrated very quickly and can not provide much constructive feedback. Users should only be involved in tests as soon as the development team is confident of the quality of the result of development.

User tests are expensive in terms of effort expended, and it may be difficult to find a sufficient number of motivated and informed users. User tests should be well planned, and must correspond to minimum methodological constraints. Experts should help with the planning of test sessions. In order to demonstrate shortcomings of the application and problems of users and to convince developers, it may be useful to videotape relevant episodes of test sessions for later review and presentation to the developers.

There must be an understanding that the tests are carried out with the aim to identify as many problems as possible, and to find better solutions immediately. The number of subjects to use for testing can be small

initially, but really conclusive tests require a minimum of about 8 users, but the numbers required can be considerably larger.

A valid and conclusive acceptance test with users provides the information for subsequent management decisions. This is the domain of realistic user trials, and field trials. Careful planning helps considerably to obtain interpretable and valid results at the end. The test conditions, instruction and training of users, data analysis procedures and benchmarks for comparison have to be defined. It is quite disappointing to arrive at un-interpretable results after considerable effort for user tests has been expended.

The selection of the measures, methods, and the planning of the field trials should be done by experts in the field. At this stage the user test activities are planned in detail up to month 18, when the first integrated prototypes are available to be inspected. A workshop will be held to introduce personnel from user partners to the test methods applied in the subsequent phases.

Field tests will be initiated in connection with the development of demonstrators. The methods to use - including logging and analysis of user data - will be elaborated according to the context in which the user partners will carry out their field tests.

#### **2.4.3.1 Using the SUMI questionnaire to measure user satisfaction**

SUMI is a validated instrument for measuring user satisfaction. It is designed to be used with end users of a software product being evaluated. SUMI enables experts concerned with the usability of a product (eg project manager, software developers, and other stakeholders), to obtain objective and trustworthy data about the subjective assessment of the product by users.

SUMI was designed to be used primarily to evaluate those systems which are generally known as 'office software' but in practice it has been used to measure a wide variety of software (from space station control systems to games) Computer users are likely to implicitly compare their level of satisfaction with any kind of software to the standard office software suites of which they have routine experience. When using SUMI to assess the usability of a prototype during development, a SUMI 'profile' can indicate the weak aspects of the prototype.

Users normally require about ten minutes to complete the inventory after having used the software for at least an hour.

User Satisfaction is one of the three key aspects of usability as defined by the ISO 9241 standard, part 11 (Efficiency, Effectiveness, Satisfaction). Satisfaction is an important variable. Low satisfaction scores inevitably mean that usage of the product either is or will be accompanied by feelings of stress with the end users. The most obvious signs of stress are lack of concentration, a tendency to make elementary mistakes, leading to increased use of help, and eventually the users refuse to use the software.

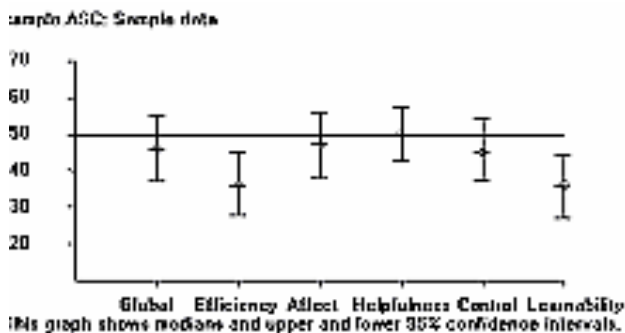
User Satisfaction can be subdivided into five aspects (measured with SUMI):

- Efficiency refers to the user's feeling that the software enables them to perform the task(s) in a quick, effective and economical manner.
- Affect is a psychological term for emotions. It refers to the positive user feeling of the user being mentally stimulated and pleased as a result of interacting with the software.
- Helpfulness refers to the user's perceptions that the software communicates in a helpful way and assists in the resolution of operational problems.
- Control refers to the feeling that the software is responding in an expected and consistent way to input and commands.
- Learnability refers to the feeling that the user has that it is relatively straightforward to become familiar with the software.

Sample Size: SUMI yields reliable information when used with appropriate sample sizes. A sample of ten or more users per system being evaluated is required to obtain statistically reliable results. Although SUMI has been used on samples as small as 3 or 4, its use in these circumstances was primarily for diagnostic purposes. On the other hand, sometimes it may only be possible to get a small handful of users. A small amount of information is better than no information at all, but results from small samples must be interpreted cautiously and critically with common sense.

The statistical analysis can be carried out with the scoring program SUMISCO. The output of SUMISCO can be divided into three components: Scale scores (Profile Analysis), User scores, and Item Consensual Analysis.

### Example of SUMI Output



## 2.4.4 Evaluation of the usefulness of metadata for information retrieval

Metadata (data about data) constitute the information that enables the effective, efficient, and accurate retrieval and use of AXMEDIS objects. There is an increasing awareness of the need for improvement the quality of metadata. The usability of metadata depends on the quality of the metadata.

A consistent capturing, updating and utilization of metadata throughout the content creation, production and distribution processes is the basic condition for an optimization of the workflow, and thus for working in a more economic and cost-effective manner. The technology developed in AXMEDIS (e.g. descriptor / metadata extractor for audio and video content) may not be inexpensive, but is supposed to pay off by an extensive automation and a virtually constant availability, and will ensure at the same time useful metadata and related contents.

The usefulness of the content of the AXMEDIS database will be directly influenced by the consistency and accuracy of the harvested metadata. High quality metadata supports the functional requirements of the AXMEDIS framework and tools (fit for purpose). The quality of metadata will affect the efficiency of technology users and the quality of products and services offered to end-users.

The evaluation of the usefulness of metadata is not part of the available portfolio of instruments for usability testing (which is largely focused on procedural and display aspects of user interaction). There are no empirically validated assessment methods for metadata usability. A solution to assess the usability of metadata will be to create a questionnaire for this purpose.

## 2.4.5 Cost/benefit analysis, value analysis, analysis of business benefits and benchmarking

The main objective of the field trials of AXMEDIS tools with real users is to inform about the quality of the solutions which were developed. This information is needed by customers, investors, and by decision makers who are involved in the implementation / purchase of new solutions.

The data to be provided should inform about

- Impact on the efficiency and effectiveness of the workflow investigated
- Quality of the result obtained by using AXMEDIS tools
- Motivating effect on users
- Direct and indirect value for the owner of the application system (decrease of production cost)

The data will be collected in carefully planned field trials.

The level of detail required in cost data will need to be sensitive to the user organisation's wishes for competitive confidentiality and their ability to practically measure costs in their processes.

The data from each user will need to be categorized by:

- Nature of user organization, including, stages of the workflow covered such as authoring, packaging, integration, distribution, etc.
- Details of which AXMEDIS tools are used
- Type of content (simple text, audio, complex multimedia)
- Volume of content produced (the efficiencies and benefits will differ substantially between low-volume/high complexity content processes and high-volume/low complexity processes)
- Nature of main distribution channel
- Also, traditional distribution channel pre-AXMEDIS, and details of new channels enabled by use of AXMEDIS tools/framework.

In addition to measures indicating quality factors, the elasticity of demand exhibited in the behavior of users may be an important aspect to observe: The trade-off between development complexity versus efficiency in use as an influence on the design of future AXMEDIS tools or between the quality of the result and cost in performing tasks.

The field tests should provide initial data, which may be analyzed and discussed with decision makers. As a result some of the important trade-offs will be recognized: A question raised may be "How much more efficient must the work procedure be in order to justify an investment of xxx Euro?"

Simple procedures to investigate these relations are rating scales or "positioning", where experts are directly asked to assess these tradeoffs. A more reliable and more costly method is based on conjoint measurement, for which efficient computer based data collection methods are available, which can even be used via the WWW.

Another useful tool to be used will be a 'benefits register' which can be developed incrementally throughout the project. A starting point for AXMEDIS is shown in the table below. This can be updated by users leading to a comprehensive checklist of benefits at the end of the project that can be used as part of dissemination and exploitation. Where possible, the suggested quantifications can be measured during the field trials in order to provide actual data.

**AXMEDIS benefits register**

Benefit	Beneficiary	Quantification?	Strategic importance
Lead time reduction for content authoring	Content creators	Lead time in days when using AXMEDIS tools/ Lead time in days before use of AXMEDIS	High



Production cost reduction for content authoring	Content creators	Average unit cost with AXMEDIS/ Average unit cost before AXMEDIS	High
Access to wider range of content elements thanks to P2P for B2B	Content creators and integrators	Available library size with AXMEDIS/ Available library size before AXMEDIS	Medium

### Costing of implementation

In order to complete the cost-benefit analysis, users will be required to record the costs of implementing AXMEDIS tools. These will include:

- Staff time
- Training costs
- Additional hardware and software
- Additional networking, communications costs
- Additional infrastructure requirements
- Etc.

In turn, this will allow for an estimation of investment requirement for AXMEDIS implementation, which in conjunction with the benefits quantification will allow for an estimation of return-on-investment.

As a conclusive analysis of the value of AXMEDIS technology this procedure will be considered. A favorable condition in the AXMEDIS project is the involvement of a substantial number of domain experts for content production and different types of distribution.

## 2.4.6 Useful Methods for AXMEDIS

Methods in the requirements phase		Remarks	Further information
<b>Contextual Inquiry</b>	In-depth analysis and observation of user behaviour in a realistic setting representative for the future application context. Close cooperation with users and various methods of analysis and forms of documentation may be used.	Can be resource-intensive. It may be difficult to involve users. Background knowledge in empirical behavioural research is useful.	Beyer & Holtzblatt (1998) www.incent.com
<b>Volere requirements</b>			Robertson & Robertson (2004) Caplan (1990)
<b>Focus groups</b>	Structured and directed meetings with representative users and application domain experts. The goal is to elicit needs and requirements from the user representatives.	A background in group management (mediation) is recommended, otherwise the validity of results may suffer.	
<b>Context of use checklist</b>	Checklists for analyzing all relevant aspects of the physical and organisation context of use.	Efficient and recommended to complement other analyses.	Bevan & MacLeod (1994)
<b>Use Cases and Scenarios</b>	Specification of user procedures and processes in semi-formal diagrams or narrative form	Also part of requirements specification methods	Constantine (1999) www.foruse.com
Methods in the design and implementation phase		Remarks	Further information
<b>Heuristic evaluation</b>	Inspection of prototypes by experts centered on "heuristics" identified from a large number of design evaluations (eg. following user interface design guidelines, web design guidelines, accessibility guidelines, cognitive dimensions guidelines). The aim is to identify problems early and quickly and to assess the usability of a scripting language for content processing.	To be carried out by 1-3 experts unconnected to the development team. Efficient, but somewhat limited to finding design defects early in the development phase.	Nielsen (1992). www.useit.com
<b>Cognitive walkthrough</b>	Systematic inspection of the cognitive processes of users		Nielsen & Mack (1994)

<b>Style guides</b>	in the execution of specified task scenarios. Various style guide exist for application environments or minimum requirements.	May be partly applicable.	See References
<b>Usability tests of prototypes</b>	A participative test with users under controlled conditions. Data on user problems is collected by observations and “thinking aloud”.	Experience in experimental behaviour research desirable. A more controlled and rigorous approach is used in systems tests.	VNET5 → resources
<b>Prototyping</b>	Used early in the design phase, either with paper prototypes, mock-ups, or early prototypes. Various forms of user tests may be applied.		VNET5 → resources
<b>Methods in the systems test and field trials phase</b>		<b>Remarks</b>	<b>Further information</b>
<b>Performance measurement</b>	Controlled and systematic measurement of user performance. This is not one method, but rather an approach which may be implemented in different ways. The aim is to demonstrate efficiency of workflow and process and benefits/added value for the customer. May include the measurement of learning time.	Can be resource intensive. Control of conditions and correct selection of samples of users are essential.	Dumas & Redish (1993) Rubin (1994)
<b>User satisfaction measurement with SUMI or QUIS questionnaires</b>	Complementary to performance measurement. The subjective assessment of system quality, which may be dissociated from objective parameters.	Cost effective, but not a replacement for performance measurement. Note that these questionnaires are validated measurement instruments, not to be confused with ad-hoc opinion surveys.	<a href="http://www.ucc.ie/SUMI">www.ucc.ie/SUMI</a>
<b>Questionnaires</b>	Tailor-made questionnaires for the analysis of the Usefulness of metadata for information retrieval, for the analysis of cost/benefit and added value.		

### 3 Usability Inspection of the AXMEDIS Tools (work performed in y3)

This chapter describes the usability inspection of the AXMEDIS Tools up to version 2.7.4.2 performed from October 2006 to July 2007 and compares the achievements after year 3 with the results at the end of year 2. It describes where recommendations were taken into account, which user problems still remain and whether new problems were detected. It includes a summary of high priority recommended actions and makes recommendations for future development.

The objectives of AXMEDIS are to develop tools that support the AXMEDIS business objectives: Something that works, looks good, and that people can and will use for content production and distribution because it speeds up and optimizes work through means of automating, accelerating and restructuring the process.

In the second phase of development the priorities were to extend the basic AXMEDIS Tools and to take recommendations for improvements into account from the users who had informally tested the tools and from the first usability inspection round.

The aim of the work reported here was to:

- To inspect the usability of the extended AXMEDIS Tools including AXEPTool
- To see where recommendations for changes have been taken into account
- To recommend further changes to achieve essential improvements of the user interface design
- To make recommendations for subsequent user testing of the AXMEDIS Tools.

The chapter is structured into four sections:

- What Usability means for the AXMEDIS Tools,
- Method and procedure of assessment and evaluation,
- Detailed description of how good the AXMEDIS Tools are.
- Summary of the improvements, and proposal of further changes to improve the usability of the AXMEDIS Tools.
- Future activities.

#### 3.1 What usability means for the AXMEDIS Tools

##### 3.1.1 Supporting Business Goals

The AXMEDIS Tools should help users and customers to increase efficiency and thereby reduce cost visibly to justify the investment to switch to AXMEDIS Tools. The new functionality should add visible value for the users, notably: Access to more content, Web usability. Therefore the AXEMDIS Tools should be easy to learn, easy to use, enable users to carry out their work tasks, leading to high acceptance in the initial phase of use of each user.

##### 3.1.2 Achieving the right Balance of Usability Goals

The following panel summarizes relevant usability goals for the AXMEDIS Tools. Many of these goals pull the design in different directions. Achieving a good balance involves making trade-offs and requires iterations to get it right. Here we are seeking to achieve a good and consistent design of the different tools as quickly as possible.

##### Visibility of System Status

The system should always keep the user informed about what is going on through appropriate feedback within reasonable time. The interface should help the user understand what is happening.

### **Match Between System and the Real World**

The system should speak the user's language, with words, phrases and concepts familiar to the user, rather than system-oriented, technical terms.

### **User Control and Freedom**

Users should be free to select and sequence tasks (when appropriate), rather than having the system do this for them. When users make a "mistake" or change their minds, the system must allow for "emergency exits" and backtracking. The system should support undo and redo.

### **Consistency and Standards**

Users should not have to wonder whether different words, situations, or actions mean the same thing. The system should follow platform conventions when they exist, and pay attention to consistency of format, icons, etc.

### **Help Users Recognize, Diagnose, and Recover From Errors**

Error messages should be expressed in plain language. The UI should guide users in helpful ways using cues and messages expressed in plain language or using icons.

### **Error Prevention**

Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

### **Recognition Rather Than Recall**

The user should not have to remember information from one part of the dialogue to another. Therefore objects, actions, options, and instructions for use of the system should be visible or easily retrievable whenever appropriate.

### **Flexibility**

The interface should be flexible so that it is appropriate for novices and experts. Accelerators - unseen by the novice user - should speed up the interaction for the expert user.

### **Aesthetic and Minimalist Design**

Interfaces should only contain relevant information. Extra information competes with relevant information and diminishes their relative visibility.

### **Help and Documentation**

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out. "Help" should be accomplished through good interface design and context-sensitive information.

## **3.2 Methods and Procedure of Usability Evaluation and Assessment**

Usability Inspection during the early development phases is carried out by experts who are not involved in the development effort. (Certain tests - such as the adherence to styles - cannot be carried out with users. These require inspection methods to be carried out by experts who are familiar with the implementation of the styles required.) They test the system according to defined use and test cases assuming the role of a user.

The number of defects found is expected to be initially quite large. Experience shows that the less mature an implementation is, the faster will defects be found. Different experts, however, do not find the same defects, and not in the same order of sequence. It is therefore advisable to use two or three test experts to evaluate a design. In later development stages longer test sessions should be foreseen.

Usability Inspection is not user testing. It is an activity based on rigorous testing procedures carried out by usability experts. The scope of inspection is to identify severe defects in application design and usability problems, to detect the nature of these problems and to suggest recommendations for possible solutions.

Usability inspection follows similar principles as code inspection for the assurance of minimum quality of a software product (assuring that it works as specified, and corresponds to the minimum quality requirements plus additional ones which were specified, for example the adherence to style guides, standards - including internal requirements).

The general procedure of the usability inspection which was carried out was the following:

1. Exploration of AXMEDIS Tools (up to version 2.7.4.2) and AXEPTool (up to version 3.2.23) and the demonstration and tutorial videos. A walkthrough of the AXMEDIS Tools using test case descriptions (WP2) was carried out by a usability expert who is not a task domain expert. This involved putting oneself in the role of a user, trying to achieve the main things such as a user will want to do. The evaluator notes problems encountered, and looks for good solutions. This is not a substitute for user testing, but can give rapid results in finding anticipated problems and generating practical solutions.
2. Repeated usability inspection of the AXMEDIS Tools and AXEPTool with a checklist, trying out task scenarios with a Laptop (Windows XP Home Edition Version 2002 Service Pack 2) and a PC (Windows XP Version 2002 Service Pack 2), and recording of design deficiencies, usability problems and defects. After the inspection the collected data were elaborated and the severity of usability problems was rated.
3. Comparison of the results with the recordings of design deficiencies, usability problems and defects found previously.

### **3.3 How usable are the AXMEDIS Tools version 2.7.4.2 and AXEPTool 3.2.23? - Deficiencies and usability problems in detail**

This chapter begins with an assessment of the installation procedures of AXMEDIS Tools, AXEPTool and of the Workflow Manager.

The following sections describe in more detail the findings for each of the AXMEDIS Tools:

- AXMEDIS Editor
- AXMEDIS Player
- AXMEDIS Player for Mozilla XUL
- AXMEDIS Player on .net
- AXMEDIS DRM Editor / Viewer
- AXMEDIS Content Processing Rule Editor
- AXMEDIS Content Processing Rule Scheduler
- AXMEDIS Programme and Publication Editor
- AXMEDIS Programme and Publication Engine Monitor

and

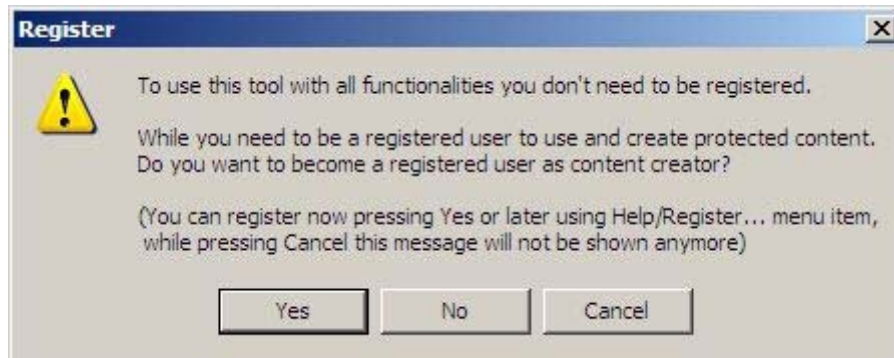
- AXEPTool version 3-2-12

#### **3.3.1 Installation of AXMEDIS Tools and Workflow Manager**

After the selection of the AXMEDIS Tools v2.7.4.2 install file a processing icon occurs for about 2 seconds and then disappears. It takes another 10 or more seconds until the install window opens. A user may assume

that he did not start the installation and click to the installation file icon again. After some time two installation windows are opened, etc. To avoid confusion and multiple starts of the installation process it is essential that the processing icon remains visible until the installation starts.

**Registration and certification of tools** is a multi-step process which is not easy to understand and which does not always work. The terminology used for registration and certification is too technical.



**Figure 1: Dialog appears after the first start of an AXMEDIS Tool**

Be more precise. Shorten the dialog and provide only two buttons as described in the example below.

To use this tool with all functionalities user registration is not needed.

Register now, if you want to create and use protected content.

You can register later (Help/Register ... menu).

Register      Do not register

When the user decides to register two windows open at the same time:



















- “Import user certificate” (which the user does not have at that time)
- “IE Explorer with the “AXMEDIS Registration Portal” (Figure 4)

The procedure which follows it not very clear, however, it needs to be done only once and therefore can be accepted. However, to avoid that users give up using the tools at this stage, provide better help for registration and certification.

The **installation of the Workflow Manager** is still very complex, very technical, very time consuming. It cannot be expected that a non technical user will be able to carry out the installation. Although the workflow tutorial contains many good details about the installation of Zope, Python and Openflow, a technical expert is needed to do the installation. The same holds true for the database.

Most of the tools need some **configuration** which is difficult to set up for a non-technical person. The available user guidelines describe in more detail now how to do the configuration, but not all modules and parameters in the “configuration” windows are described and minimal changes to configuration files provided with the AXMEDIS Tools result in the immediate crash of a program.

## Start Menu

<ul style="list-style-type: none"> <li> AXMEDIS DRM Editor</li> <li> AXMEDIS DRM Viewer</li> <li> AXMEDIS Editor</li> <li> AXMEDIS Player</li> <li> AXMEDIS Player on .net</li> <li> AXMEDIS Prog and Pub Editor</li> <li> AXMEDIS Prog and Pub Engine</li> <li> AXMEDIS Prog and Pub Monitor</li> <li> Uninstall AXMEDIS Tools</li> <li> Annual Public report, 2006</li> <li> AXMEDIS Content Processing Rule Editor</li> <li> AXMEDIS Content Processing Rule Scheduler</li> <li> AXMEDIS CP GRID Script Language</li> <li> AXMEDIS Player for Mozilla XUL</li> <li> Publishable results, 2006</li> <li> AXMEDIS Skin Player</li> <li> AXMEDIS for all</li> <li> Axmedis User Manual</li> </ul>	<p><b>Production Tools</b></p> <ul style="list-style-type: none"> <li>AXMEDIS Editor</li> <li>AXMEDIS DRM Editor</li> <li>AXMEDIS DRM Viewer</li> <li>AXMEDIS Content Processing Rule Editor</li> <li>AXMEDIS Content Processing Rule Scheduler</li> <li>AXMEDIS Programme and Publication Editor</li> <li>AXMEDIS Programme and Publication Engine</li> <li>AXMEDIS Programme and Publication Monitor</li> </ul> <p><b>Players</b></p> <ul style="list-style-type: none"> <li>AXMEDIS Player</li> <li>AXMEDIS Player on .net</li> <li>AXMEDIS Player for Mozilla XUL</li> <li>AXMEDIS Skin Player</li> </ul> <p><b>Guidelines</b></p> <ul style="list-style-type: none"> <li>AXMEDIS User Manual</li> <li>AXMEDIS CP GRID Script Language</li> </ul> <p><b>Documentation</b></p> <ul style="list-style-type: none"> <li>AXMEDIS for all</li> <li>Annual Public report, 2006</li> </ul> <p><b>Uninstall</b></p>
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**Figure 2: Start Menu**

The full names of most of the tools appear now in the Start Menu. To be consistent present the full name for all tools in the start menu (Programme and Publication Editor / Engine / Monitor, and Digital Rights Management Editor / Viewer). It has been suggested also by the user partners to structure the start menu into “production tools”, “players”, “guidelines”, and “documentation”. This will help users to find a specific tool or guideline.

### 3.3.2 AXMEDIS Editor

#### 3.3.2.1 Visibility of system status

**Increase the visibility of a selected panel** (“Resource Viewer”, “Metadata Editor”, “Visual Editor”, “DRM Editor”, “Protection Editor” or “Workflow Viewer”). Highlight the name of the selected (= open) panel so that it becomes more visible compared to the other panel names.

„Save as ...“ icon is missing in the first column of the „File“ menu in the top menu bar.

**Increase visibility of a selected icon** in the tool bar (see example in Figure 3).



**Figure 3**



The “Query” window has several deficiencies (Figure 4) which are described in the following:

- Three different selection methods are used (tick box for Available Sources; drop down menu for Logic Operator Selector, multiple select from list for Info Result). This makes the specification of a query more difficult for the user. Provide one selection methods for all lists.
- In the “InfoResult” list the element “DCMI:date” occurs twice. If the difference is “creation date from”, “creation date to” then rename these elements so that users can distinguish them: ”DCMI:date(from)”, “DCMI:date(to)”.
- “Reset” and “Submit” buttons are located in the AXMEDIS Query panel, “Ok” and “Close” buttons in the overall “Query” window. It is easier to spot the “Ok” button because it is at the bottom of the “Query” window then the “Submit” button. One tends to press the “Ok” button to submit a query, and wonders why nothing is happening. Make the “Submit” button more visible. This can be done by moving the “Ok” and “Close” buttons to the “Query result” panel.
- Visibility of the different panels in the “Query” window will be improved when all panel titles appear at the top of the window. It seems to me that the title “AXMEDIS Query” becomes obsolete, when you move the titles “AXInfo/DCMI Query” and “PAR Query” to the top of the panels. This would reduce redundancy.

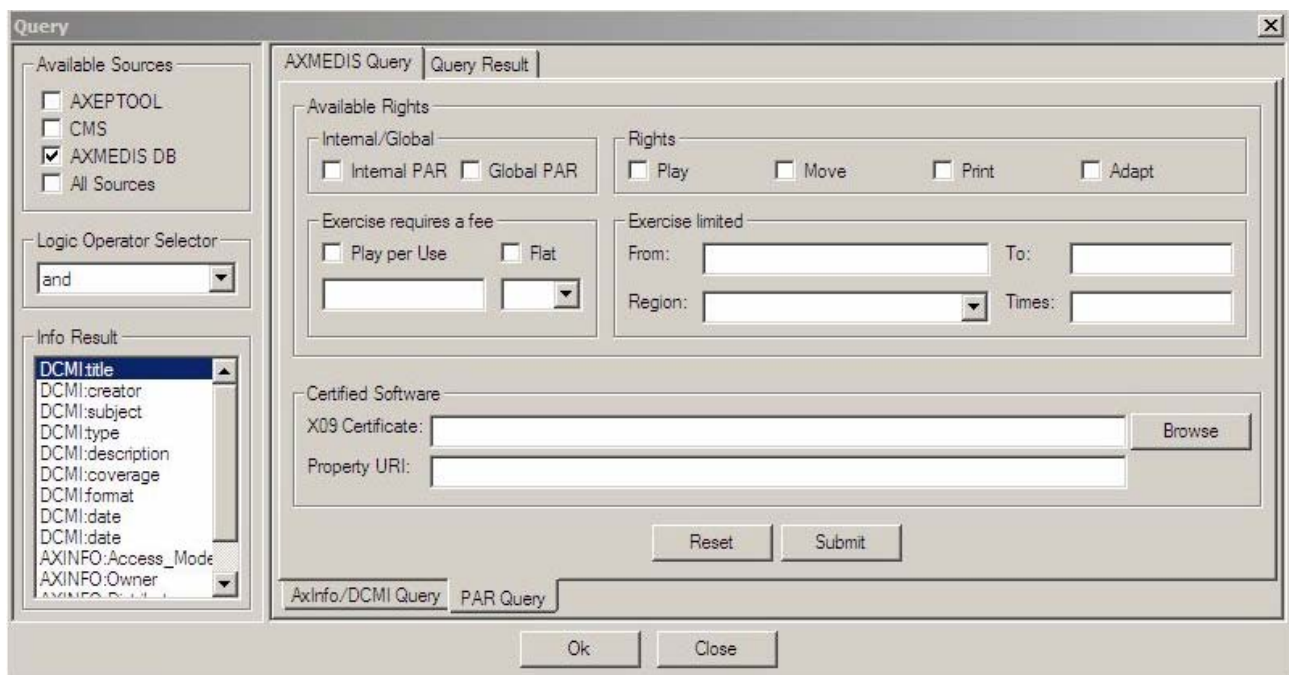


Figure 4: Query window

### Visibility in the Metadata Editor

Selection of Dublin Core or AXMEDIS Info from the Combo box of the Metadata Editor is not practical for complex objects which contain many sub-objects as can be seen in Figure 5. It may be reasonable to expand the tree to make the selected element visible.

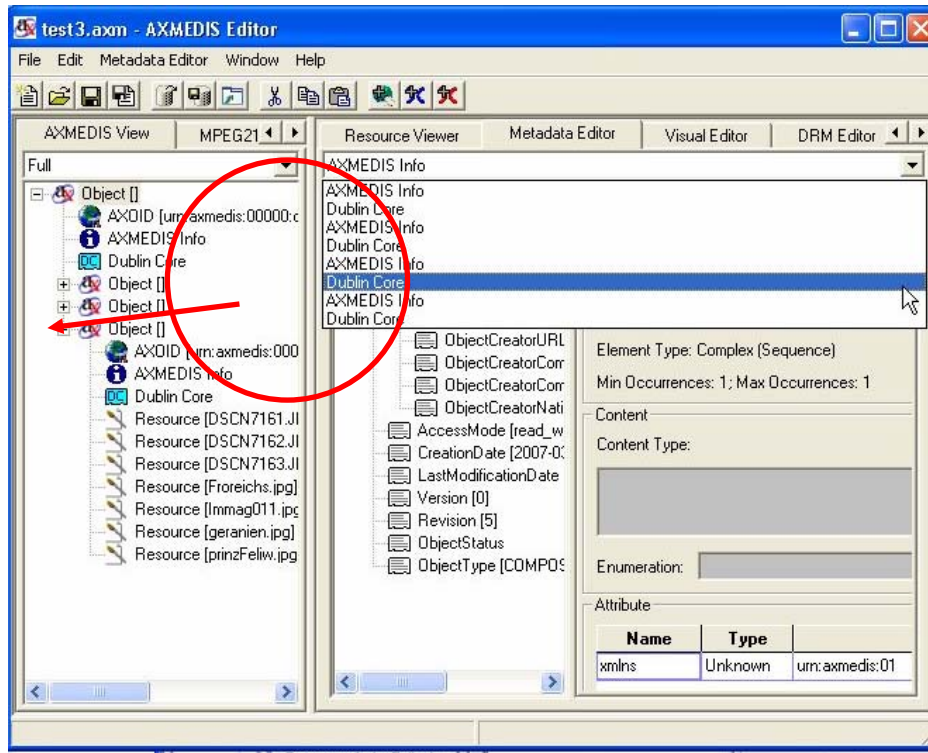


Figure 5: Metadata Editor

### 3.3.2.2 Match between the system and the real world

**Terminology.** The names of many commands and icons (e.g. icons “add embedded resource”, “add object reference” and “add embedded object” and commands in context menus, terms used in the Visual Editor, DRM Editor, Protection Editor) are AXMEDIS specific, technical and unfamiliar to the users. An on-line glossary would help.

**Terminology.** In the “Query Result” window the string "NULL" indicates that the information is not present in the object. “Not available” would be easier to understand for users than “NULL”.

#### Metadata Editor

Metadata editing is complicated, tedious, the procedure is very technical and not self-explaining. To add metadata elements, and to define their type you have to work from the bottom of the window to the top contrary to usual work procedures (top down).

**Technical terms** such as “Expand/Collapse Children Items” (Figure 6) should be replaced by words which are more familiar for users, eg. “Sub Items”.



Figure 6: Metadata Editor menu

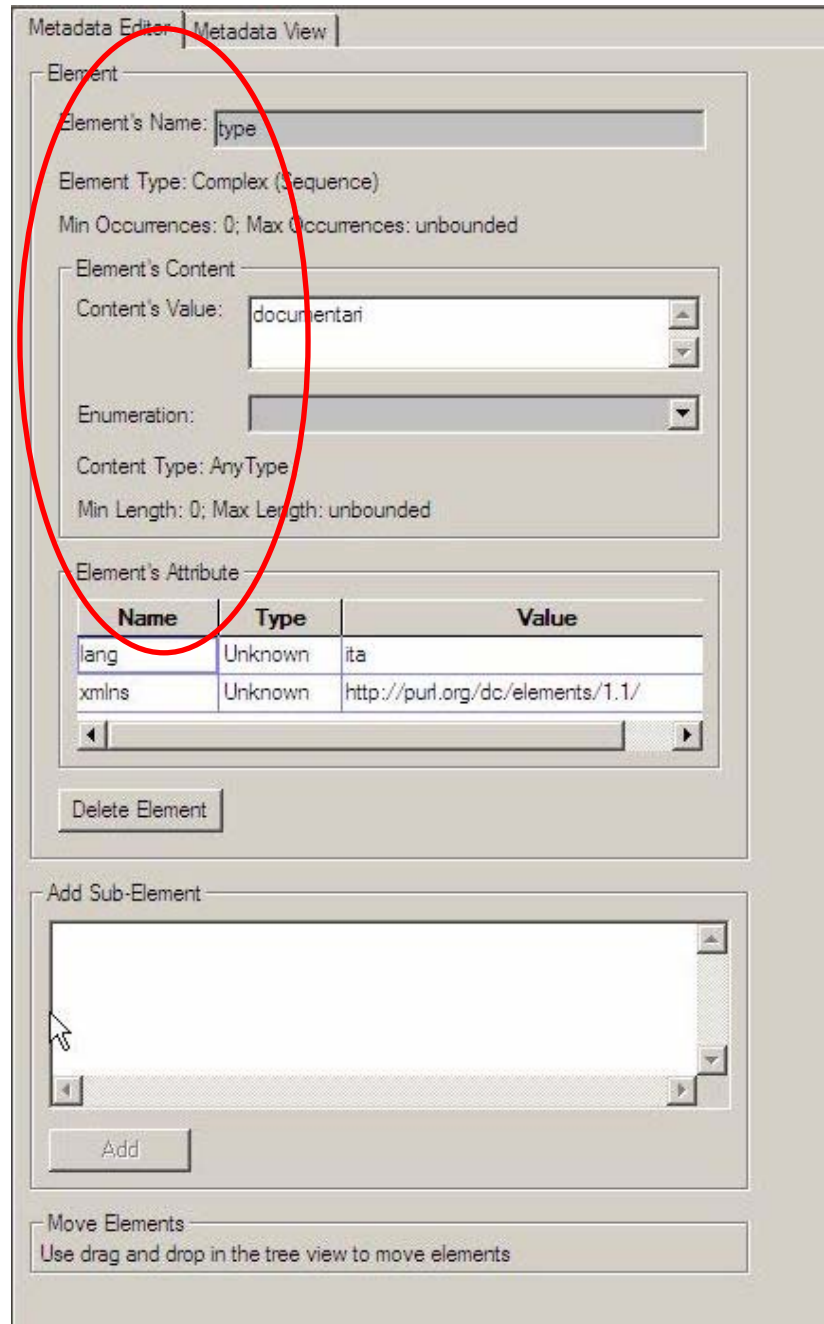


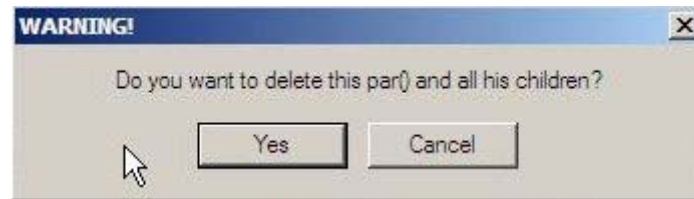
Figure 7: Metadata Editor

**Redundant information in the Metadata Editor** such as “Element, Element Type”, “Content, Content Type”, “Edit Metadata Element, Add Child Element, Add button” can be reduced and make the Editor appear simpler for the user (Figure 7).

On the other hand the Metadata Editor wastes space to the right of the input fields. Widen the “Metadata Editor” and “Metadata View” panels.

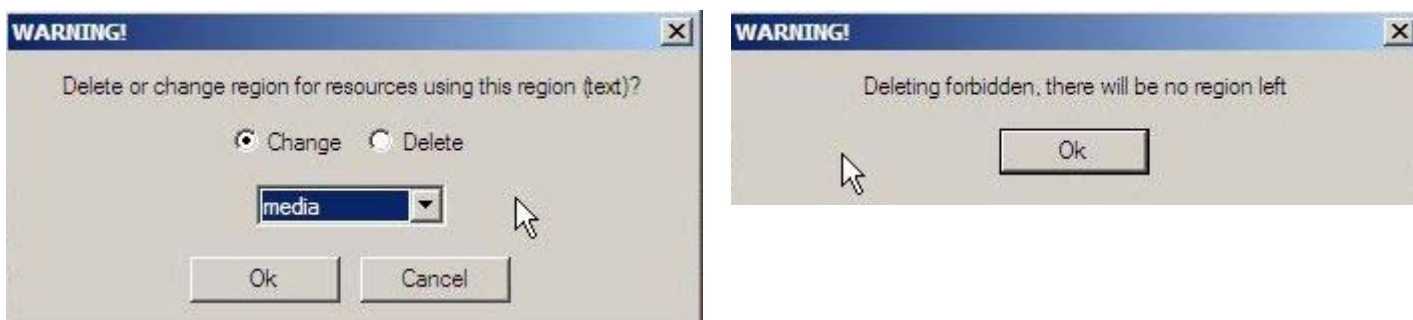
## Visual Editor

**Avoid the use of technical terminology.** Instead of “... delete this par() and all his children” it may be easier to understand for a user if you use “delete this par and all associated/related/sub elements” (Figure 8).



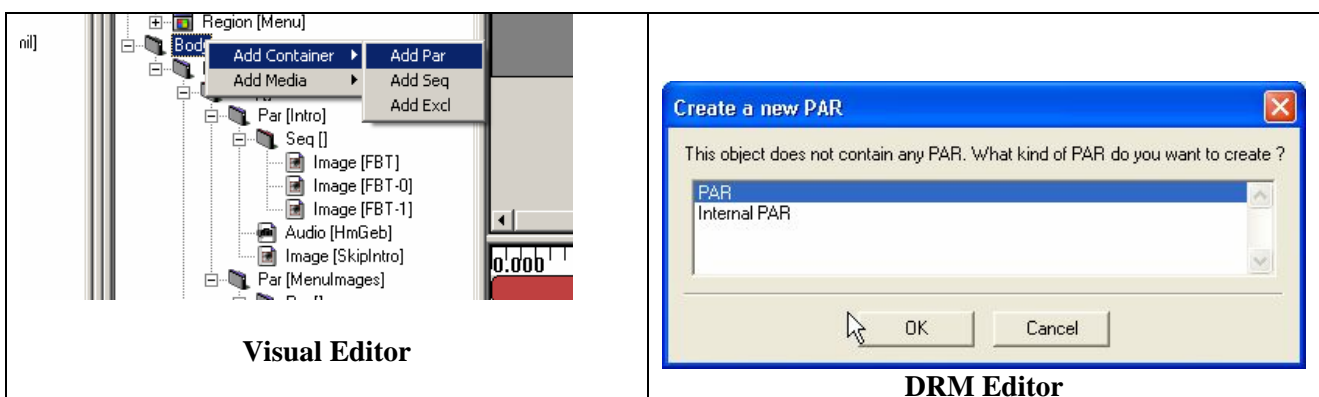
**Figure 8: Try to avoid technical terminology such as “all his children”**

Deleting elements in the visual editor opens the following windows (Figure 9) which are difficult to understand.



**Figure 9: Delete or change in the Visual Editor**

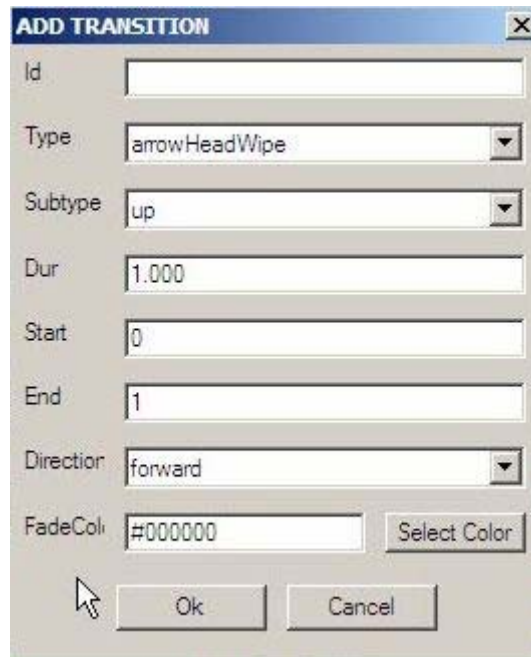
**Abbreviation Par and PAR are used in different parts of the AXMEDIS Editor with a different meaning.** In the Visual editor the command “Add Par” (Figure 10) means “add parallel playing” while in the DRM editor “Add PAR” means “Add Potentially Available Rights”. It is suggested to use the term “Add parallel” or “Add parallel playing” in the Visual Editor. “Add parallel playing” is also more meaningful to the user compared to “add par”. Avoid using the same abbreviation with different meaning in different places.



**Figure 10: Abbreviation Par and PAR are used in different parts of the AXMEDIS Editor with a different meaning**

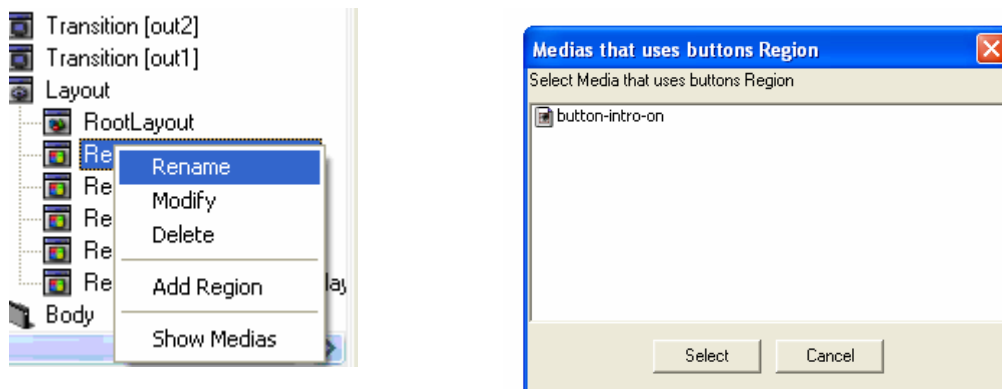
The same problem occurs with the command “Add Excl” which has the meaning “Add exclusive playing”. The abbreviation “excl” is also used to name the extension of Excel files. To avoid confusion it is suggested to use “Add Exclusive” or “Add exclusive playing” in the Visual Editor.

Some text in the “ADD TRANSITION” dialog window is cut off: “Director” instead of “Direction”, “FadeCol” instead of “FadeColumn” (Figure 11).



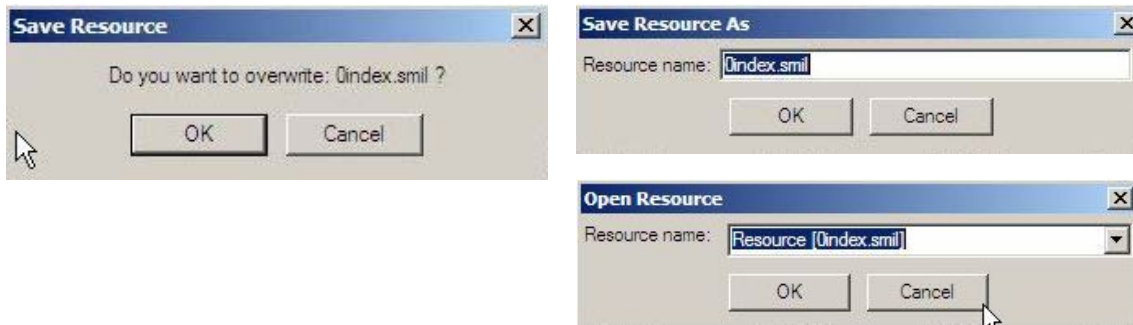
**Figure 11: Some text has been cut off**

The plural of medium is media. Instead of “Show Medias” (Figure 12) use the term “Show Media”. In the screenshot on the right it should read “Media that use buttons Region”, “Select Media that use buttons Region”.



**Figure 12: One Medium or several Media but NOT Medias**

Replace “Resource” in the title and body of dialog windows with “SMIL” (Figure 13).



**Figure 13: Dialog windows in the Visual editor use inconsistent terminology “Resource” and ”SMIL”**

**Terminology in the “DRM Editor” window.** Create a new PAR. Write the full name “Potentially Available Rights” instead of the abbreviation PAR.

### 3.3.2.3 User Control and Freedom

No defects found.

### 3.3.2.4 Consistency and Standards

**Inconsistent names.** In the “File” menu the command name is “Save on database ...”, the label of the respective icon says “Upload into database”.

**Inconsistent command names “Refresh” and “Collapse All”.** “Edit → Refresh” and “Refresh” from the context menu in the tree view collapse the tree hierarchy. In the DRM Editor this function is called “collapse all” (Figure 14). Be consistent.

**Inconsistent use of icons.** “Expand”, “Expand All”, “Collapse”, “Collapse All” icons in the Metadata Editor are different compared to the “Expand All” and “Collapse All” icons in the DRM Editor / Viewer (Figure 14). Be consistent and use the same icons for expand and collapse in all AXMEDIS Tools.

**Inconsistent behaviour of “Refresh”.** When only the root object is visible in the tree “Refresh” does “Expand”. Be consistent.

	AXMEDIS Editor	Metadata Editor (AXMEDIS Editor)	DRM Editor / Viewer
<b>Expand</b>	-		-
<b>Collapse</b>	-		-
<b>Expand All</b>	-		
<b>Collapse All</b>	Refresh		






**Figure 14: Inconsistent use of names and icons for expand / collapse**

**Inconsistent titles in the “Query” dialog window** (Figure 15). Be consistent, eg. always start the title of this window with “Query” and then add the name of the selected command which led to this window. For example “Query (add an embedded object)”, “Query (add a reference)”.

AXMEDIS Tool	Title of the “Query” dialog window
AXMEDIS Editor	Query
AXMEDIS Editor	Embed Object
AXMEDIS Editor	Reference
AXMEDIS Content Processing Rule Editor	Selection Editor
AXMEDIS Programme and Publication Editor	P&P Query Dialog

**Figure 15: Inconsistent titles in the “Query” dialog window**

**Inconsistent style of icons.** Some icon design is still not consistent with other AXMEDIS Tools (Figure 16). Be consistent.

AXMEDIS Editor	 Open from Database	Open from Database ...
AXMEDIS Editor	 Upload into Database ...	Save on Database ...
AXMEDIS Content Processing Rule Editor	 Open from Database	Open from Database ..
AXMEDIS Content Processing Rule Editor	 Upload into Database	Upload into Database ...
DRM Editor	 Save	Save to server ...

**Figure 16: Inconsistent style of icons**

**Irritating behaviour of Visual Editor.** Double click to a smil index opens the resource viewer, and not the Visual Editor. This seems inconsistent to a user, although it is not. And when a smil index is selected in the tree hierarchy and the user selects the Visual Editor, the smil file is not immediately opened. This behaviour is not consistent with the selection of the other panels. Users could be supported by a proactive behaviour of the visual editor, eg. a message or request to select a smil file.

**“Resource Viewer” menu.** In this menu either use the name “Player/Viewer” or “Players/Viewers”, but not “Player/Viewers”.

**Title of a dialog window is not consistent with the command name which invoked the pop up of the dialog window** (Figure 17). In the “Configuration” window a click to the “Add” and “Edit” buttons opens the “Set Param” window; better solution: “Add Parameter” or “Edit Parameter”.

When no parameter was selected a click to the “Edit” button opens a window with the message “before press edit,select parameter”; better solution: “First select a Parameter to be edited.”

Click to the “Remove” button opens a “Warning” window; better solution: “Remove” window.



Figure 17: Configuration - Dialog windows

In the Visual Editor the text in the title bar of many dialog windows is written in capital letters, e.g ADD META (Figure 18), ADD REGION, ADD TRANSITION, etc. Use consistent layout. Use a capital letter only for the first letter of a word.

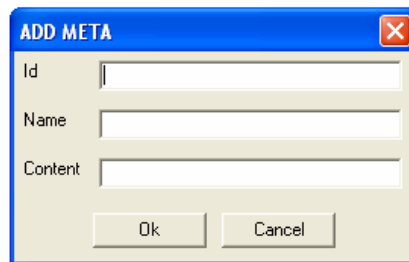


Figure 18: Do not write title text in capital letters.

### 3.3.2.5 Help Users recognize, diagnose, and recover from errors

**Wrong entries in data entry forms.** The AXMEDIS Editor does not detect wrong entries in the fields of data entry forms. It will be advantageous for users, if the editor can detect and highlight errors in data entry fields and explain how to recover from errors.

### 3.3.2.6 Error Prevention

#### Visual Editor

**Error Messages, Warnings, Messages.** The “Visual Editor” still contains a lot of “WARNING!” windows (Figure 19). The term “WARNING!” is not very user-friendly. Better name the window “Delete” and ask the user to “Confirm delete”.

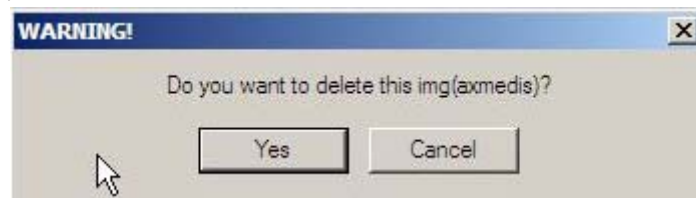


Figure 19: Delete dialog in Visual Editor

If a delete will affects resources (which use the region to be deleted) a special dialog window opens (Figure 19). The message is not very clear. Better write

“Change region for resources using region [name] and delete region [name]

or

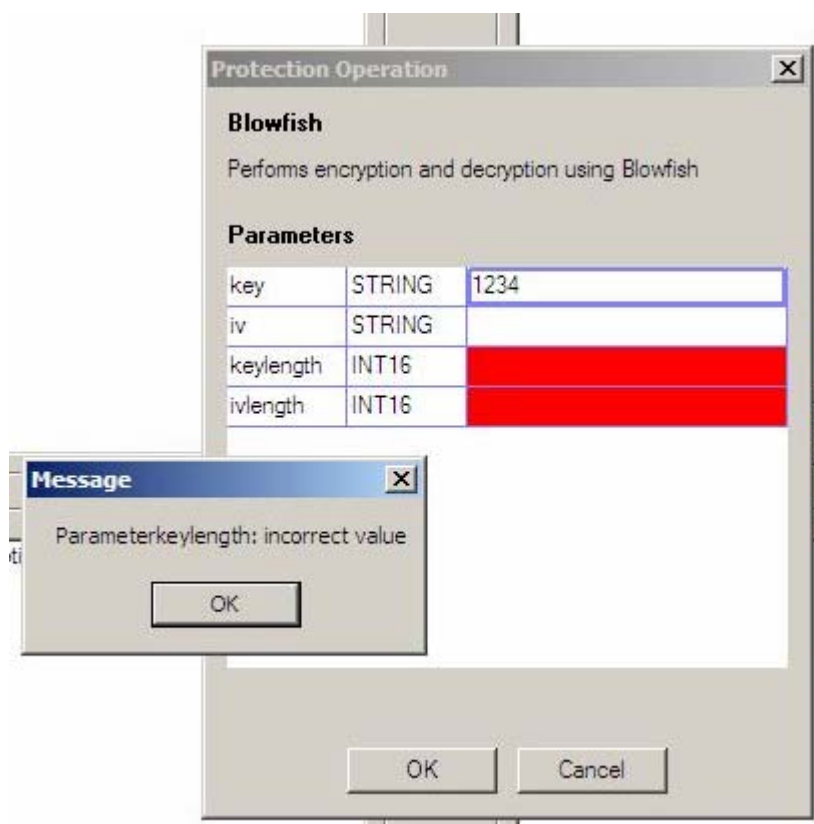
“Delete region [name]





**Figure 20: Be more precise and consistent with other AXMEDIS Tools. Replace “WARNING!” by “Confirm Delete”**

Messages in the Protection Editor are difficult to understand. Here the user needs help in terms of a list of possible parameters from which to select (Figure 21).



**Figure 21: Message in the Protection Editor**

### 3.3.2.7 Recognition rather than Recall

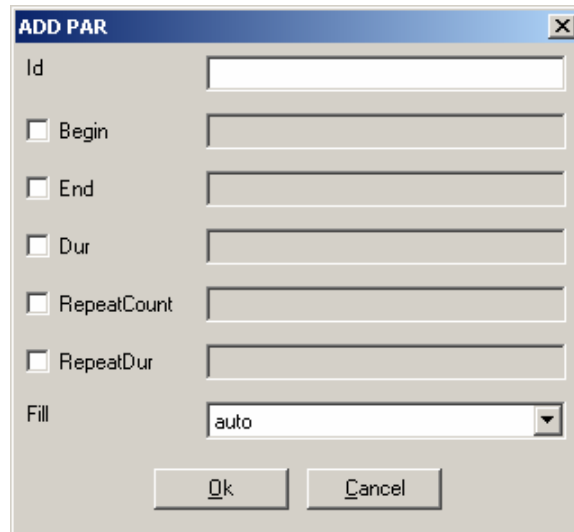
**Data entry forms.** Optional data fields are not marked. There is no visual distinction between “choose one” or “choose many” in the data entry forms.

#### Visual Editor

**Abbreviations.** Using complete words instead of abbreviations in windows and menus is desirable, because the user will have to recognize the word instead of remembering the meaning of an abbreviation. Instead of abbreviations use meaningful words. Examples: In the “Add Transition” window “Duration” is easier to

recognize/understand compared to “Dur”. “Number of repetitions” instead of “RepeatCount”, “...” instead of “RepeatDur” . “Coordinates” is easier to understand than “Coords”(Figure 22).

**Inform the user about the kind of input to be inserted in input fields.** The user may not know what to insert in input fields. A beginner will find it difficult to enter correct values for “Begin” and “End” in the dialog windows (Figure 23). Help the user and provide examples: seconds or minutes for duration, default values, the type of input required such as “+0.000;skip2,activateEvent“. Drop-down menus where the user only needs to recognize and select the appropriate value are a good solution but not always applicable. Empty fields could present at least default values or help button next to input fields or a help button per dialog window could be provided which opens a help window with examples of the expected input.



**Figure 22: Visual Editor**

Instead of “Href” and “Resource” button (Figure 20, left) in the “ADD LINK” window, the use of “Resource” instead of “Href” and “Browse” button instead of “Resource” button would be more meaningful. Instead of “Source” and “Resource” button (Figure 20, right), the use of “Resource” and “Browse” may be more meaningful.

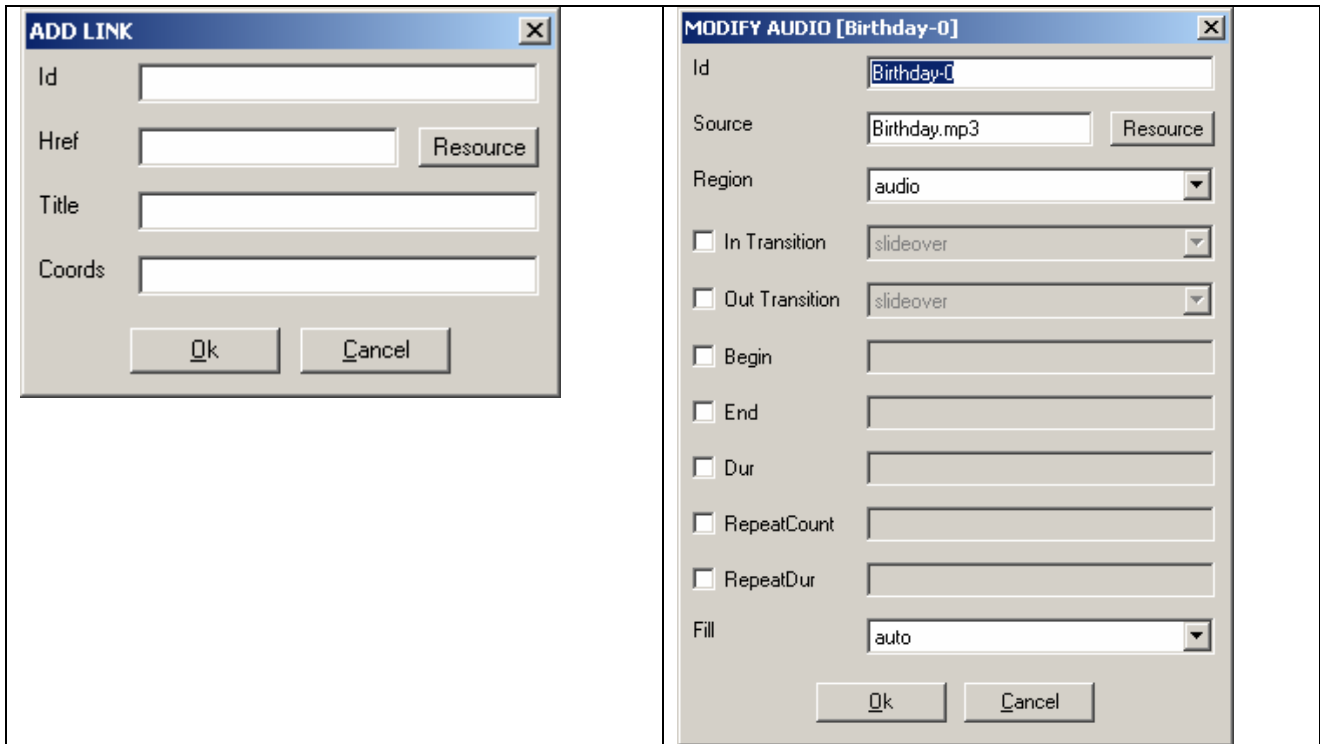


Figure 23: Visual Editor

**Sometimes it is not obvious what input is required for text fields.** The example (Figure 24) from the SMIL user guide lets the user assume that in both, “Id” and “Name” input field, text is required. However, a user who did not see this example, may enter a figure in the “Id” field and just one word in the “Name” field. The chosen example (from the SMIL user guide) is irritating because the title of the dialog window is “MODIFY META” and in brackets the name of the meta is “rename this meta”. This is a too simple example. Use realistic names.

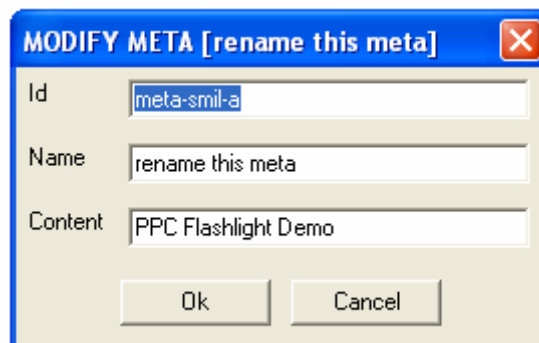


Figure 24: Visual Editor

### 3.3.2.8 Flexibility

**Shortcuts.** Many keyboard shortcuts and function keys are provided. It is questionable whether all these shortcuts are needed. Shortcuts should be provided for frequently used commands only and should be consistent across AXMEDS tools. However, one of the user partners’ opinion is: “I personally disagree with this statement: use of keyboard shortcuts can speed up and improve efficiency in any software. In fact Office offers shortcuts for a variety of commands and functions (see for example <http://support.microsoft.com/default.aspx?scid=kb;en-us;290938>); furthermore shortcuts for virtually “any” command can be personalized (see <http://office.microsoft.com/en-us/assistance/HA010429651033.aspx>) . I

completely agree that the shortcuts should be consistent among all the tools. The possibility to further personalize them would be even better, but I'm not sure it is realistically feasible.”

**DRM Editor Panel.** Expand and Collapse commands contained in the DRM Editor / Viewer, are missing in the DRM Editor Panel of the AXMEDIS Editor.

### 3.3.2.9 Aesthetic and Minimalist Design

**Some icons are not meaningful, and neither visually nor conceptually distinct** (Figure 25). Avoid designing icons for abstract concepts.

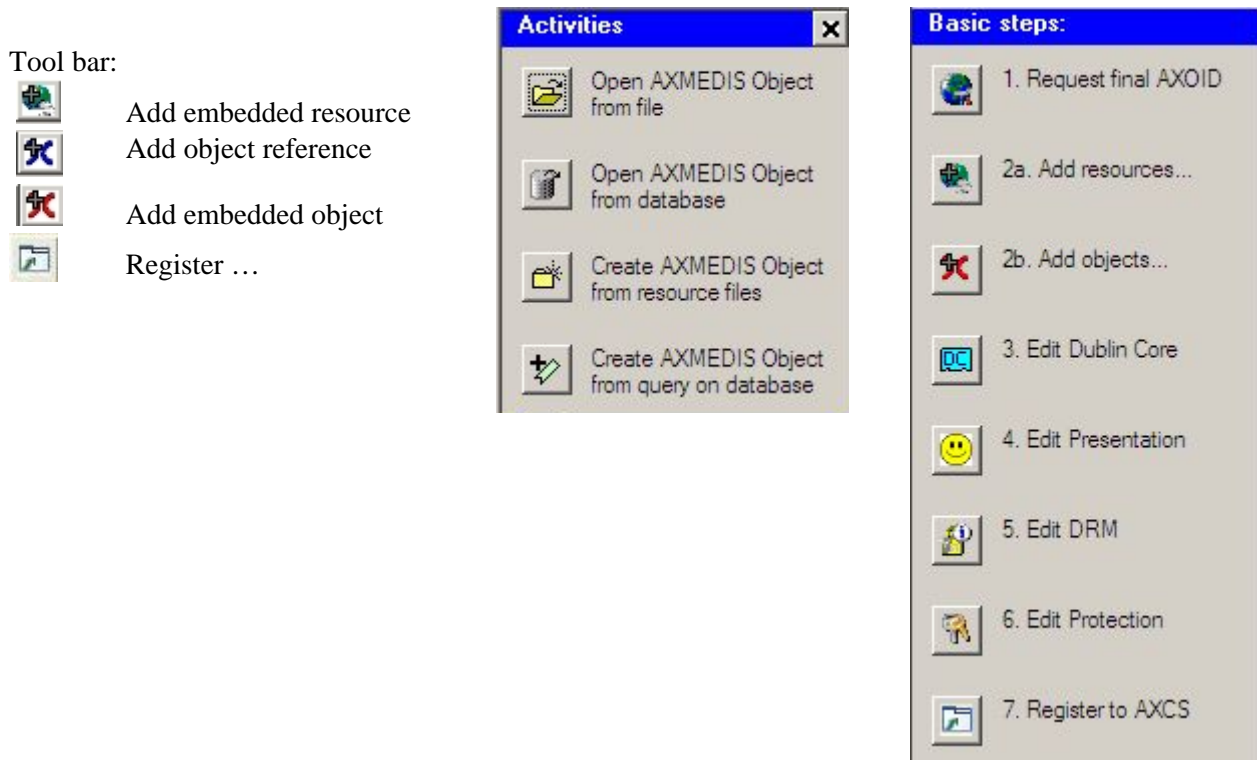


Figure 25: Meaningless icons

### 3.3.2.10 Help and Documentation

Configuration of parameters is explained in detail in the guidelines. However, there are still some parameters for which explanations cannot be found such as PMSCLIENT, RESOURCE\_EXTENSIONS.

**User guidelines** are available and very helpful. The AXMEDIS Major Tools User Manuals 1.4 pub is provides as pdf file. It contains a chapter for the AXMEDIS Editor with the description of the functionality and a task oriented description with screen dumps which are not always up-to-date.

**On-line help** is available, but very brief. It would be desirable if the on-line help would contain more text from the User Manuals.

### 3.3.3 AXMEDIS Player

#### 3.3.3.1 Visibility of system status

It is not visible that some commands and icons cannot be applied in specific system states (especially when no file is open). Grey out commands and icons in system states where they cannot be applied.

It is not visible that the “Sliding Show” command and icon are toggles which either start or stop a slideshow. Change “Sliding Show” in the “File” menu to “Start/Stop Slideshow” and mark the command when a slideshow is running. Change the colour of the “Sliding Show” icon when a slideshow is running to make the difference between start and stop visible.

The green arrow buttons sometimes appear twice, in the toolbar and in the “View” panel (Figure 25). The reason is that the user can switch “Show Controls” on and off. Duplication is not needed and will irritate the user.

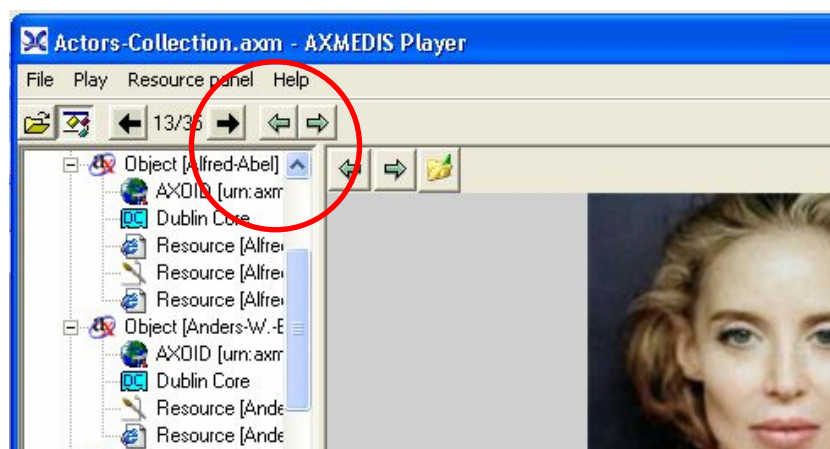


Figure 26: Some buttons appear twice in the tool bar and in the “View” window

**Missing label.** There is no indication what the figures between the black arrow buttons in the toolbar stand for (Figure 26/27). Make the label “Resource index” visible with mouse over.



Figure 27: Resource Index

**Delays caused by processing.** It takes at least 2 seconds to start a slideshow. But sometimes loading a resource needs 10 or more seconds and long delays may occur after “Zoom in / Zoom out”. An impatient user will click to the “Slideshow” button again and by doing so stop the slideshow. A delay indicator icon is needed for delays longer than 2 seconds showing that some processing is going on.

Slideshow is a walk through image resources only not through audio, video. Back history applied while a slideshow is running, goes back to the resource where a slideshow was started. This is not visible, difficult to understand. If a user does not understand the functioning of a command and cannot predict the behaviour, he will not use the command.

#### 3.3.3.2 Match between the system and the real world

“**Slideshow**”. Replace the name “Sliding show” by “Slideshow” in all places where it occurs.

**The title of the “Play” menu does not communicate.** It contains one command with the same name as the title of the menu “Play”, and the commands “Stop”, “Pause”. The “Play” menu is not needed in the top menu bar. The commands of this menu are needed when a resource is displayed in the “View” window. Move the commands "play", "pause", "stop" to the "View" panel.

**Inappropriate location of commands.** The commands “Next Resource”, “Previous Resource”, and “Sliding Show” are located in the “File” menu. These commands would be better located in a “View” menu. However, these commands can be executed much faster by clicking to buttons in the toolbar.

**“Open” vs “Load”.** The use of “Load” from the “Resource panels” menu in addition to “Open” is unclear. The “File” menu may be better location for the “Load” command.

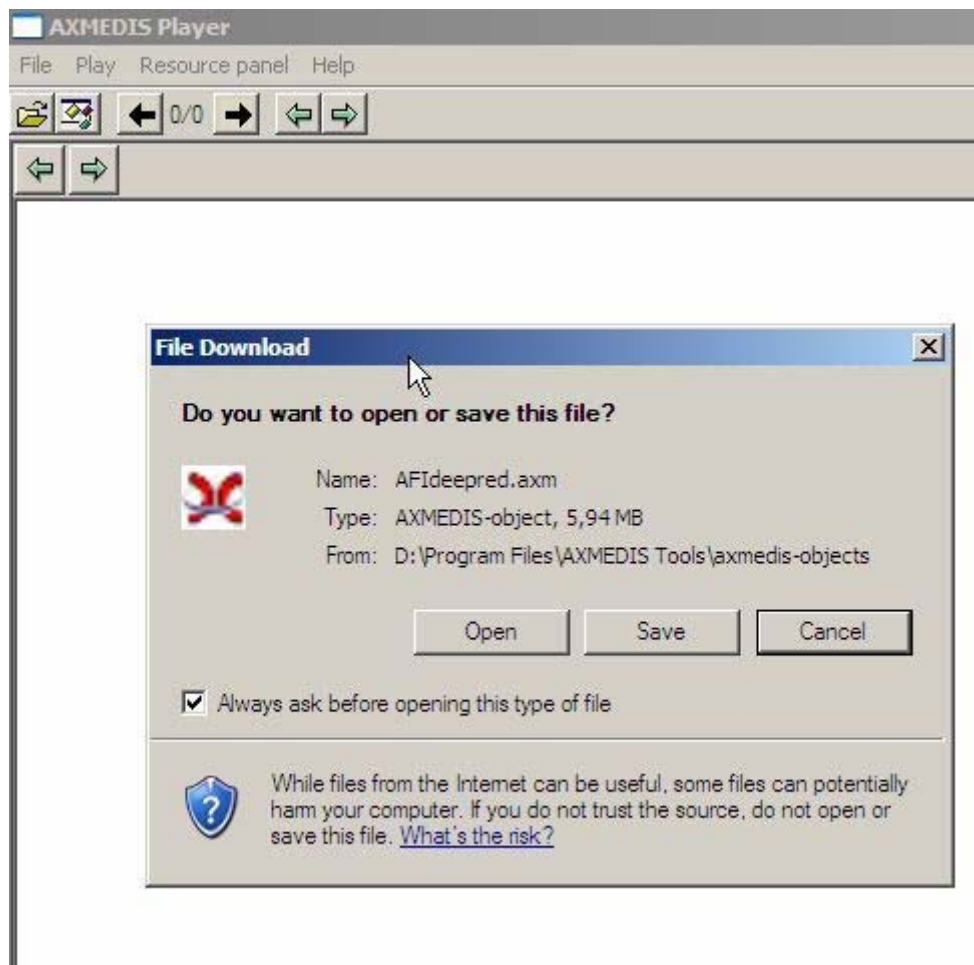


Figure 28 Load file AFIdeepred.axm yielded this message

### 3.3.3.3 Consistency and Standards

**Inconsistent AXMEDIS player tool icon.** The icon of the AXMEDIS Player in the AXMEDIS Tools start menu is red colored, in the top line of the AXMEDIS Player window the icon had a blue color and in version 2.7.4 the icon disappeared. Use consistent color and icon in all places.



**Figure 29: Red colored icon vs no icon and blue frame used for AXMEDIS Player in different locations**

Either “Start” or “Pause” icon is visible in the “View” window. Be consistent with other AXMEDIS Tools where both “Start” and “Pause” icons are visible all the time.

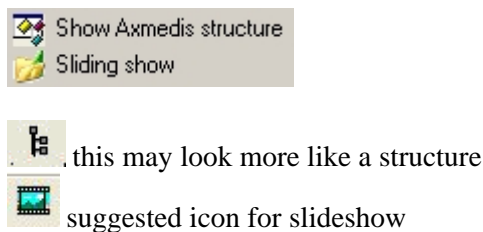
### 3.3.3.4 Flexibility

**Shortcuts.** “Space” and “Backspace” shortcuts for “Next Resource” and “Previous Resource” are desirable.

**Fullscreen.** The size of the “View” window can be adapted. However, there seems to be no way back to the menus after setting the “View” window to “full screen”.

### 3.3.3.5 Aesthetic and Minimalist Design

Although the icons “Show AXMEDIS structure” and “Sliding show” have been changed, they are still meaningless. (Figure 30).



**Figure 30: New Icons for “Show AXMEDIS structure” and “Slide Show”**

### 3.3.3.6 Help and Documentation

**On-line help** is not implemented. Provide the user manual online.

**User guidelines.** The AXMEDIS User Manual contains a chapter “AXMEDIS Player”. The description is not up-to-date with the AXMEDIS Player included in v2-7-4.

### 3.3.4 AXMEDIS Player for Mozilla XUL

Several errors were encountered when using this player.

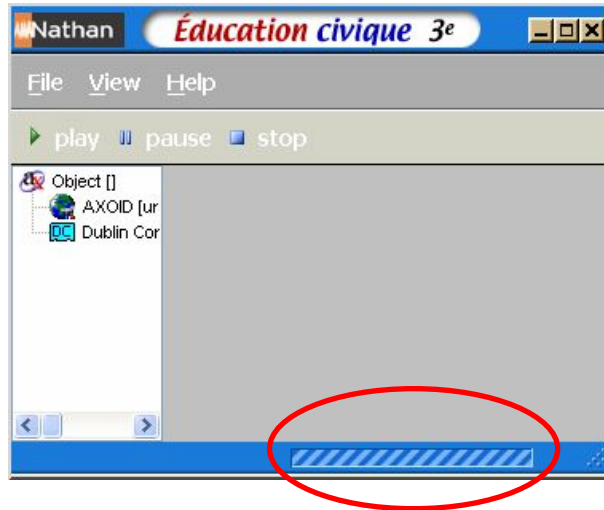


Figure 31: After the start of AXMEDIS Mozilla Player the “tree view” window is empty and the status bar at the bottom of the window seems to run forever.

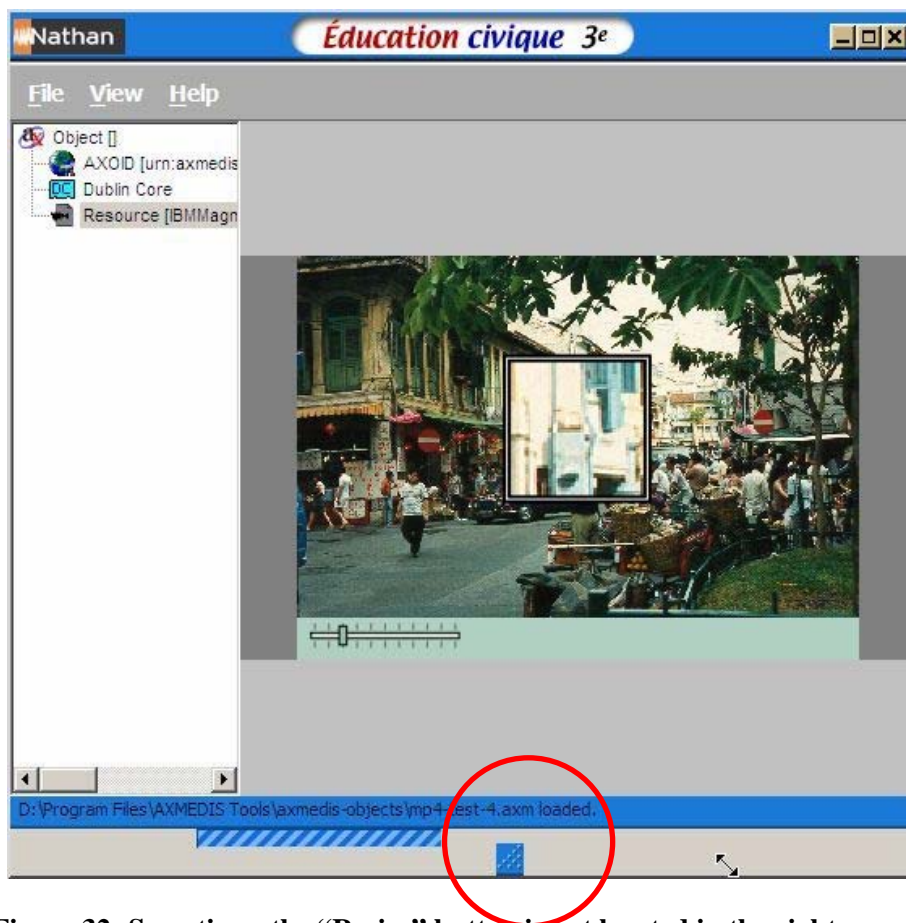


Figure 32: Sometimes the “Resize” button is not located in the right corner.

A slideshow cannot be stopped by just clicking to the STOP button.



Strange behaviour occurred when the the“Load” command was applied (see Figure 33/34).

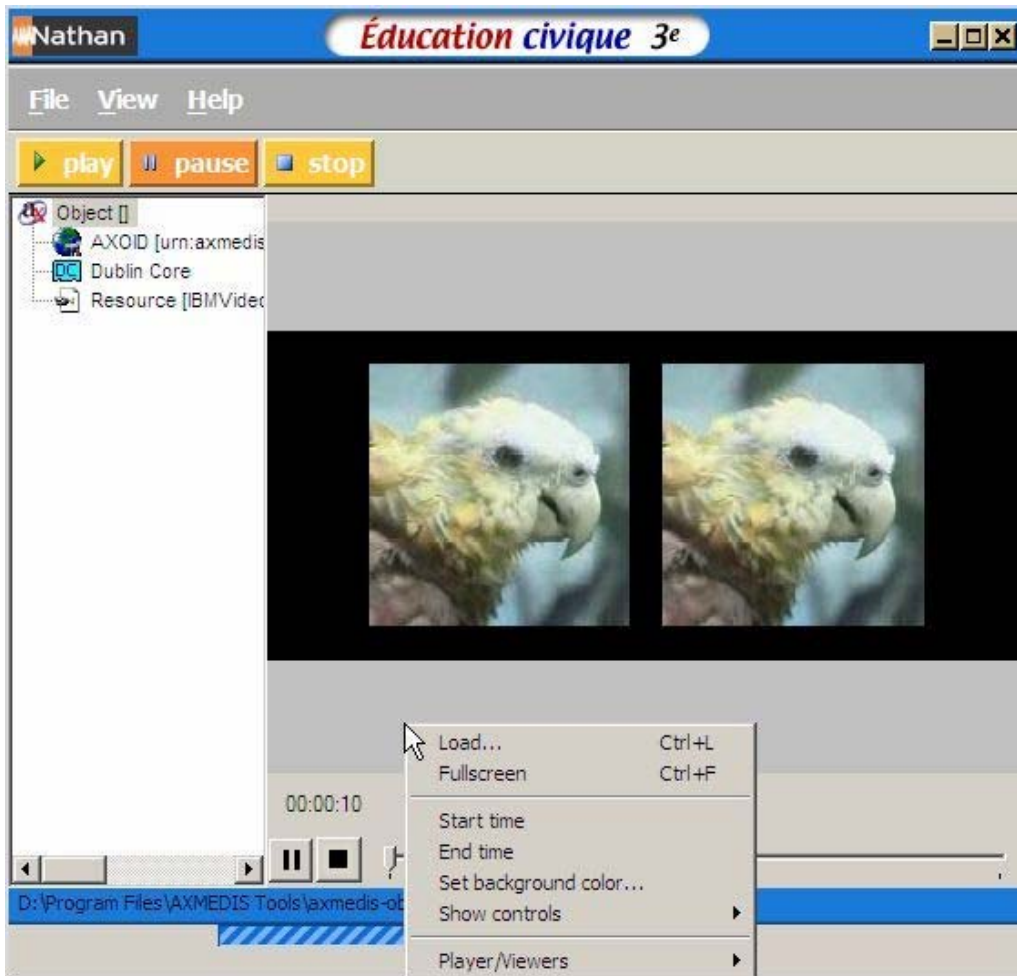


Figure 33



Figure 34

### 3.3.4.1 Visibility of system status

The “play” button in the toolbar does not only start playing. It switches between play/pause/resume. This is not visible for the user. On the other hand the “pause” button is not implemented yet.

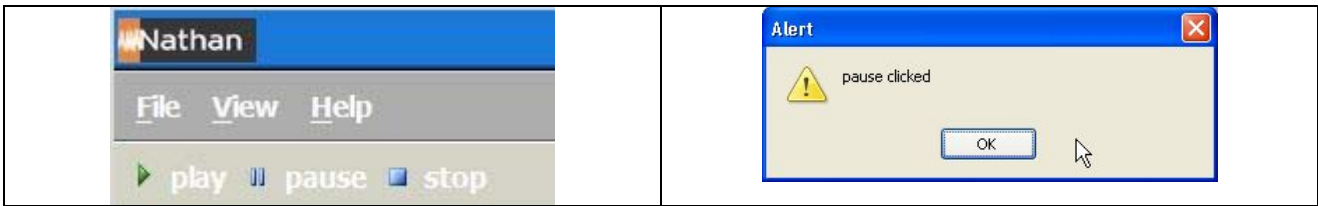


Figure 35: Left: Menu bar and Tool bar of AXMEDIS Player for Mozilla XUL. Right: The “pause” icon is not implemented yet.

### 3.3.4.2 Match between the system and the real world

No defects found.

### 3.3.4.3 User Control and Freedom

No defects found.

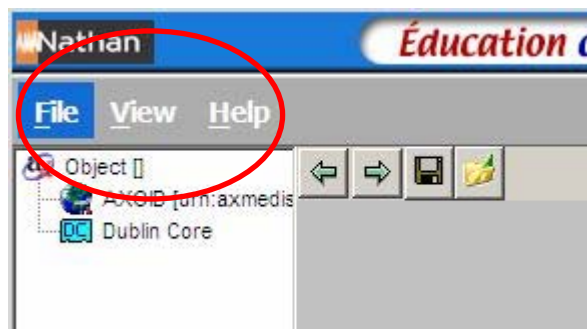
### 3.3.4.4 Consistency and Standards

**Inconsistent use of tool name in different locations.** The name of the player in the start menu is “AXMEDIS Player for Mozilla XUL”, the title bar of the open window says “Nathan Education civique 3e”, in the task bar “AxMozillaPlayer” is displayed and the user manual is called “AXMEDIS Mozilla Player Manual”. Use the same name in all places.

**Shortcuts do not work as promised in the top menu bar.** The underlined first letter of “File”, “View”, and “Help” (Figure 36) let users assume that the menus can be opened using the first letter together with either ALT or CTRL or ALT+CTRL key. Sometimes the following shortcuts work, sometimes they do not work.

Alt+F opens File menu  
Alt+F+O and Ctrl+O open Open File menu  
Alt+F+X exit

Alt+V opens View menu  
Alt+V+T opens Toolbar  
Alt+V+S opens Statusbar  
Alt+V+H opens Hierarchy, but **Ctrl+H does not work**  
**Ctrl+Alt+H and Alt+H open a Toolbar** which is visible in Figure 38



**Figure 36: Menu bar of AXMEDIS Player for Mozilla XUL**

### **3.3.4.5 Help Users recognize, diagnose, and recover from errors**

No defects found.

### **3.3.4.6 Recognition rather than Recall**

No defects found.

### **3.3.4.7 Flexibility**

**Expand / Collapse commands** may be desirable to have when the hierarchy tree is open.

### **3.3.4.8 Aesthetic and Minimalist Design**

No defects found.

### **3.3.4.9 Help and Documentation**

**User guidelines** are provided separately and are not yet included in the AXMEDIS User Manual. Include the user guidelines into the overall AXMEDIS User Manual.

**User guidelines** are very brief and do not explain all the menus and functionality. Be consistent with the user guidelines for the other Tools.

Online help is missing. Provide the user guidelines online.

## **3.3.5 AXMEDIS Player on .net**

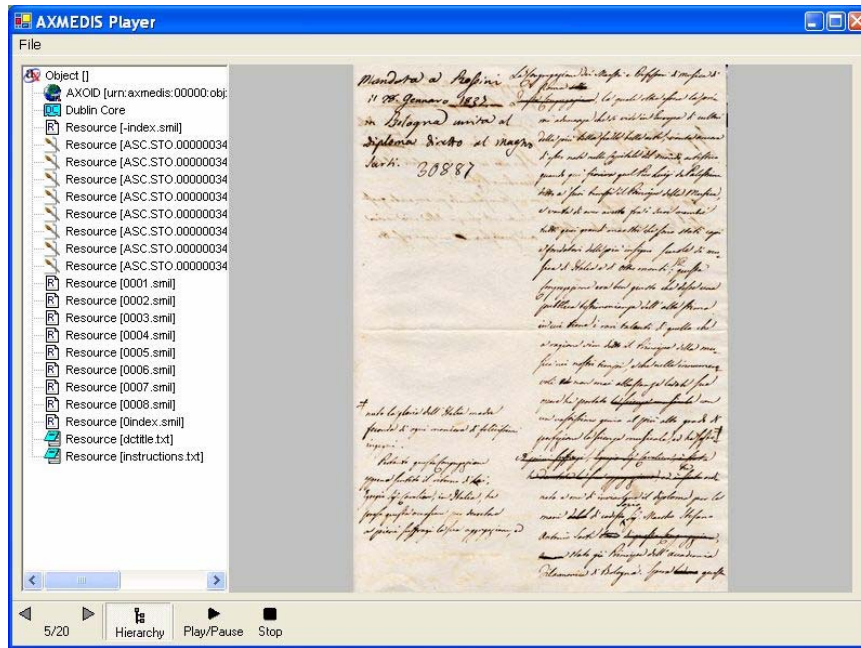
### **3.3.5.1 Visibility of system status**

After the start it is irritating that the name of the open AXMEDIS Player on .net is called “AXMEDIS Player” (Figure 37). A user may assume that the wrong tool was opened.



**Figure 37: AXMEDIS Player on .net**

**The name of an open file is not visible** (Figure 38). Be consistent with other tools and display the name of the open file in the headline of the window.



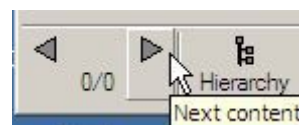
**Figure 38: The name of the open file is not visible**

The number of the currently played resource 5 is shown in the resource index at the left bottom of the window. However, the played resource is not highlighted in the hierarchy tree (Figure 39).

When the user navigates in the right “View” window and follows a link to another resource, the figures in the resource index do not change, nor is the selected resource highlighted in the “hierarchy” window.

The function of the “previous/next content” buttons is not visible. Click to the buttons shows the first resource of the previous/next object. If the user wants to see all resources, included in an object, he must expand the tree and select the resources by double click to a resource.

The index (between “previous/next content” buttons) is difficult to understand. For a simple object containing 5 resources, it shows “1/5”. For a complex object with 12 objects each containing several resources, it shows “1/12”. Make the function of the index visible.



**Figure 39**

The “Play/Pause” buttons play audio/video resources. However the buttons are visible all the time. Grey out the button when they cannot be applied because there is text resource etc.

### 3.3.5.2 Match between the system and the real world

The term “Hierarchy” does not match well with the real world of users. Something like “Play list”, “Content structure” or “Media structure” may be more meaningful.

### 3.3.5.3 User Control and Freedom

No defects found.

### 3.3.5.4 Consistency and Standards

**Inconsistent location of tool bar in different players.** In other players, the tool bar is located at the top of the window below the menu bar. Here it is located at the bottom of the window.



**Figure 40: Tool bar at the bottom of the AXMEDIS Player on .net window window**

**Inconsistent command names, layout, and location of functions used in different Players.** Figure 41 shows the most striking differences.

AXMEDIS Player	AXMEDIS Mozilla Player	AXMEDIS Player on .net
File →  Show AXMEDIS structure	View → Hierarchy Ctrl+H	-
 Tool bar at the top	-	 Tool bar at the bottom
Play →  Play	-	-
Play →  Pause	-	-
Play →  Stop	-	-
Play or  Pause Tool bar at the bottom	 Tool bar at the top	 Tool bar at the bottom
-	 Tool bar at the top	-
Stop Tool bar at the bottom	 Tool bar at the top	 Tool bar at the bottom
File → Open Ctrl+O	File → Open ...	File → Load ...

**Figure 41: Inconsistent command names, layout, location of function used in different tools**

### 3.3.5.5 Help Users recognize, diagnose, and recover from errors

No defects found.

### **3.3.5.6 Recognition rather than Recall**

**Expand / Collapse commands** may be desirable to have for big hierarchy trees.

### **3.3.5.7 Aesthetic and Minimalist Design**

No defects found.

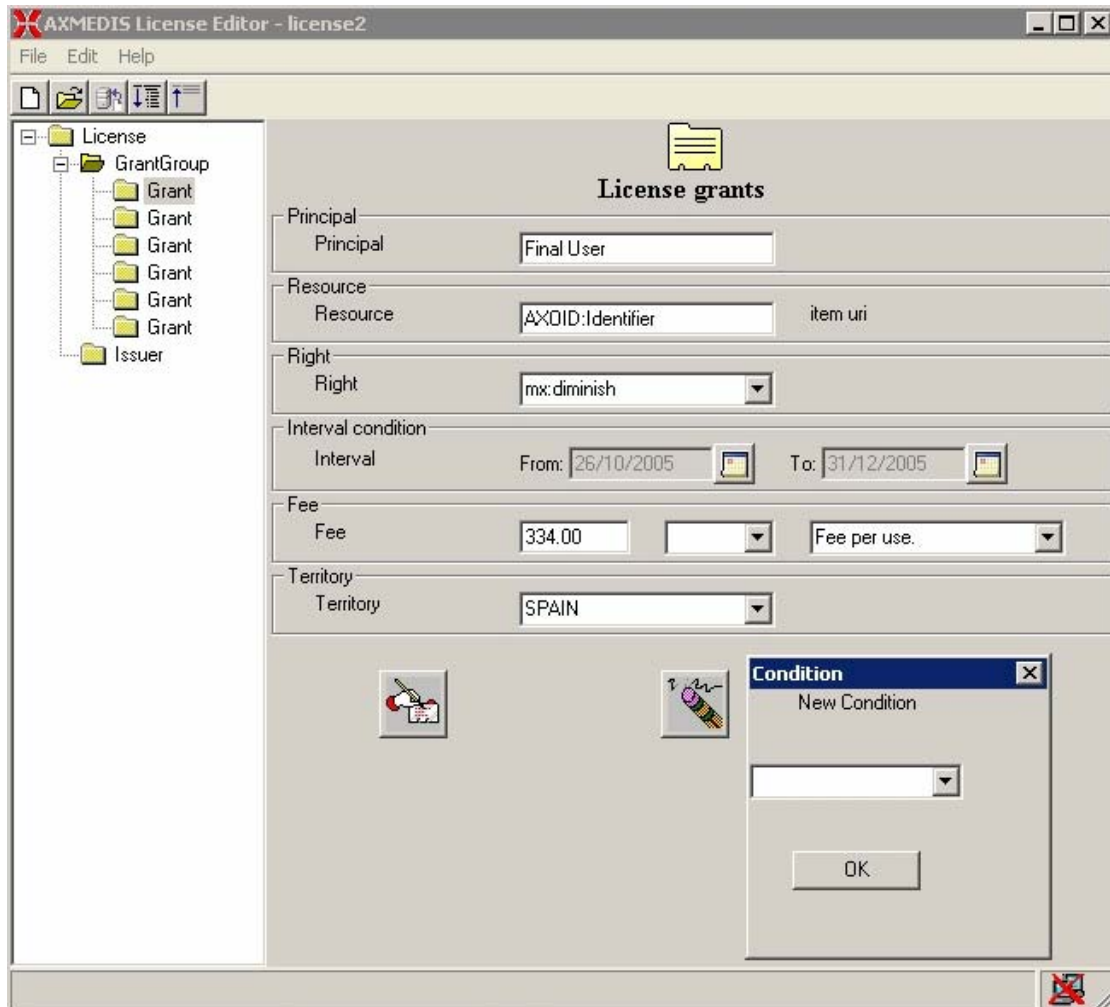
### **3.3.5.8 Help and Documentation**

**Help and User guidelines** are not available.

## **3.3.6 AXMEDIS DRM Editor / Viewer**

### **3.3.6.1 Visibility of system status**

**Redundant information.** Several windows display a lot of redundant information. For example, in the “Grant Group” window, “Grant Group” occurs in the border of the window and as a title in the upper middle of the window. The names of most data entry field labels (Principal, Resource, Right, Interval, Fee, Territory, Number) occur twice (Figure 42), in the border which surrounds each data element and as a field label. Avoid redundancy to increase visibility.



**Figure 42: AXMEDIS DRM Editor with open “Condition” window ready to add a new condition.**

**Some commands and icons cannot be applied in specific system states.** “Save to file”, “Save to server”, and “Close” can be selected even when no file is open. Grey out commands and icons in system states where they cannot be applied to increase visibility for the user and to help the user recognize commands which can be applied in a specific state.

**Visibility of calendar icon.** The calendar icon (Figure 43 in the “Interval condition” part) is neither well visible nor is the name of the icon displayed with mouse-over.

**Visibility of license elements.** Several grants in one license appear with the same name “grant” in the license tree (Figure 43). Numbering the grants will increase visibility. A user may even need the opportunity to name the grants.

**Misleading spelling.** The “License Grants” window shows only **one** “**License Grant**” at a time (Figure 43). Better change the name of the window to “License Grant”.

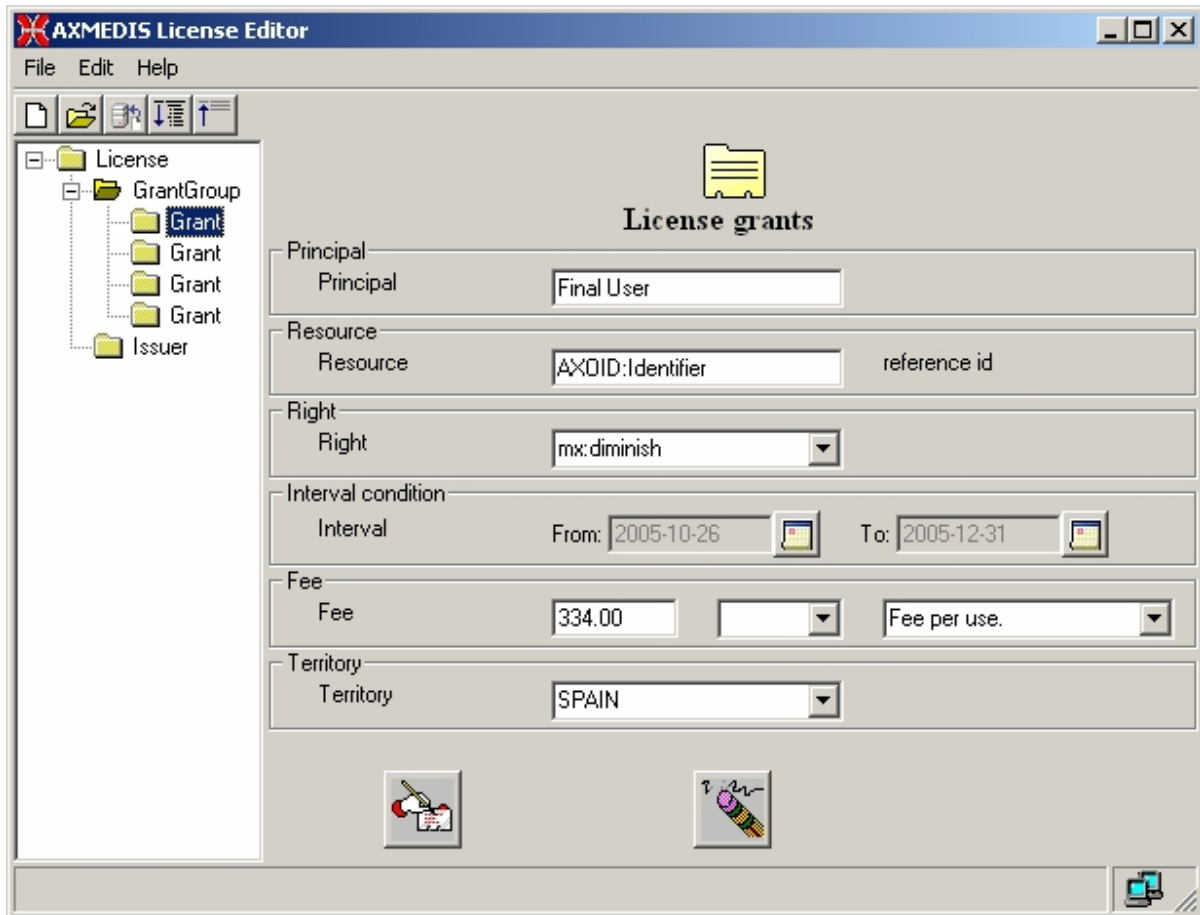


Figure 43: AXMEDIS DRM Editor, “License grants” window

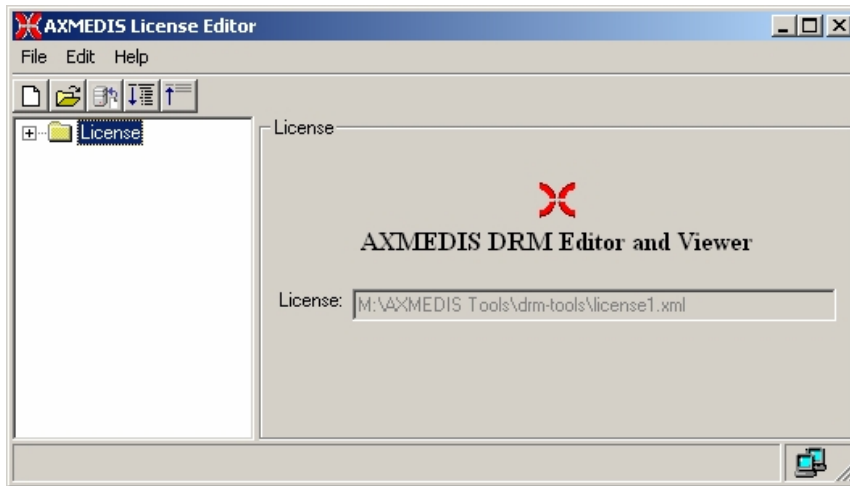
**Visibility of the progress of task completion.** During the creation of a new license it is not visible how much of the work has been done and what else needs to be done because only one element in the licence tree is displayed at a time. It may be useful to add another level to the license tree which shows the elements that have been defined so far (as it was implemented in version 1) or to provide another view showing the complete license content.

When carrying out “create a new grant” once or several times, new grant(s) pending to be filled are added. The next user task is to complete these grants. To do so the user needs to expand the tree structure and select the grant to be edited. To make the progress of task completion more visible and to speed up work the DRM Editor could anticipate that the user will continue completing the grant after “create a new grant” and therefore expand the tree structure for the user.

**Visibility of icon names.** The names of the “ExpandAll” and “CollapseAll” icons will be more readable with a space between the words: “Expand All”, “Collapse All”.

**After “collapse” only the tree structure is refreshed, not the license window.** After the selection of “collapse” the tree structure view shows the root node, and the license window shows the last grant or issuer data which was open before “collapse” was carried out.





**Figure 44: AXMEDIS License Editor**

**“Search” command not immediately visible.** The “Search” command is hidden in the “Edit” menu and it is the only command in the “Edit” menu. Why not just put a „Search“ icon in the top icon bar?

**Visibility of calendar icon.** The calendar icon in “Interval condition” part is neither well visible nor is the name of the icon displayed with mouse-over.

**Visibility of the progress of task completion.** During the creation of a new license it is not visible how much of the work has been done and what else needs to be done because only one element in the licence tree is displayed at a time.

### **3.3.6.2 Match between the system and the real world**

**Terminology** used in the license description and in the “Search” form is different: “Principal, Resource, Right, Interval, Fee, Territory, Number of times” vs. “AXOID, Person, Right, Territory, Usage, Date”. *Use the same terminology in different locations.*

**Data entry forms.** It is not obvious whether all fields in the data entry forms (e.g. “Search” form, “License Grant” form) must be completed, if the completion of a field is optional or obligatory. Not all field labels are familiar to users, brief, and descriptive.

**Misleading terminology “open from file” vs. “open from server” (“save to file” and “save to server”).** The user always handles a file. The difference is whether the file is on the PC or on a server. Therefore it may be more precise to use the command names “open” and “open from server” as well as “save” and “save to server”.

The “open” icon opens a file stored on the PC, the “save” icon saves a file to a server. Make this clear to the user and use the labels “open from file” and “save to server”.

### **3.3.6.3 User Control and Freedom**

**Search.** The “Search” command still does not seem to work correctly.

### 3.3.6.4 Consistency and Standards

**Layout of window titles is inconsistent with the other tools.** The titles of windows in the DRM Editor and Viewer are centred and a picture looking like an icon is provided together with the title. This is different compared with all the other AXMEDIS Tools. *Consistency across tools will increase visibility for the user.*

**Inconsistent terminology.** Different names for the tool can be found in different locations (see Appendix).

**Inconsistent terminology.** The command “Edit → Search” opens a window with the title “Check DRM conditions” and a sub-title “Search Grant” and at the bottom of the window a “Check” button. *The title of the window should be consistent with the command “Search” and the button should be named “Go” or “Submit” or “Search” (consistent with such a button in the other AXMEDIS tools).*

**Inconsistent style of some new icons.** The icons “Creates a new grant”, “Deletes this grant”, “Add a new condition to the grant”, and “Deletes a condition of the grant” are not consistent with the icons used for create, delete in the other AXMEDIS Tools.

**Inconsistent style of command names.** The command names “Creates a new grant”, “Deletes this grant”, “Add a new condition to the grant”, “Deletes a condition of the grant” (Figure 45) are too long. A better solution may be “Create new grant”, “Delete grant”, “Add new condition”, “Delete condition”. The size of all these icons is not the same.



**Figure 45: Command names “Creates a new grant”, “Deletes this grant”, “Add a new condition to the grant”, “Deletes a condition of the grant” (from left to right)**

**Inconsistent “delete” procedure.** The procedure to delete a grant is not consistent with the procedure for deletion of a condition of a grant. While a grant is deleted with click to the delete icon which is visible in front of the grant, deletion of a condition is done by click to the delete icon first and then the condition to be deleted is selected from a menu. Make the “delete” procedure consistent within the DRM Editor and with the other AXMEDIS Tools.

**Inconsistency of calendar icon.** The calendar icon in the “Interval condition” part is not consistent with the calendar icon used in the other AXMEDIS tools.

### 3.3.6.5 Help Users recognize, diagnose, and recover from errors

**Wrong entries in data entry forms.** The AXMEDIS DRM Editor does not detect wrong entries in fields of the “search/check DRM conditions” form. For example, numbers can be entered in the “territory” field, letters can be entered for “number of times” or “data” field, etc.

### 3.3.6.6 Error Prevention

**“Save” command is missing.** The user can only choose between “Save to file” or “Save to server” which opens a dialog window and asks for the file name. Selection of an existing file name will overwrite the existing file without asking the user to confirm this.

**DRM Editor does not care if edits are saved.** Edits which the user did not explicitly “Save” will be lost when “Close” or “Open from file” or “Open from server” or “New” is performed. Always ask the user to confirm “Save edits” or “Discard edits”.

### **3.3.6.7 Recognition rather than Recall**

**Data entry forms.** Optional data fields are not marked.

### **3.3.6.8 Flexibility**

Conditions have to be added one after the other. This is a tedious task. **Multiple add of conditions** may speed up the editing of a license.

**Shortcuts** are not provided.

### **3.3.6.9 Aesthetic and Minimalist Design**

**Icon design.** The design of some new icons is neither visually nor conceptually distinct. In addition some pictures on the screen look very similar to icons, but do not represent a command.

### **3.3.6.10 Help and Documentation**

**User guidelines** are available and very helpful. The AXMEDIS User Manual contains a very brief chapter for the AXMEDIS DRM Editor with the description of the functionality, a task oriented description with screen dumps.

**On-line help** is not available. It would be good to have the AXMEDIS User Manual on-line. Instructions which guide the user are missing (e.g. completion instructions for data entry forms).

## **3.3.7 AXMEDIS Content Processing Rule Editor**

### **3.3.7.1 Visibility of system status**

**Some windows do not have titles.** “Workspace”, “Output”, “Debug Monitor”, “JavaScript Editing window”, “Selection Editor” and other windows do not have titles. Window titles will add to visibility.

**Window titles appear in different locations.** The titles of “Rule view” and “Library view” (Figure 47) appear at the bottom of the “Workspace” window as well as “Call Stack”, “Local Variables”, “Watches”, “Breakpoints” in the “Output” window. In the “Selection Editor” (Figure) window titles of different views appear either at the top of the window (“AXMEDIS Query”, “Query Result”) or at the bottom of the window (“AxInfo/DCMI Query”, “PAR Query”). Visibility will be increased when all titles appear at the top of a window.

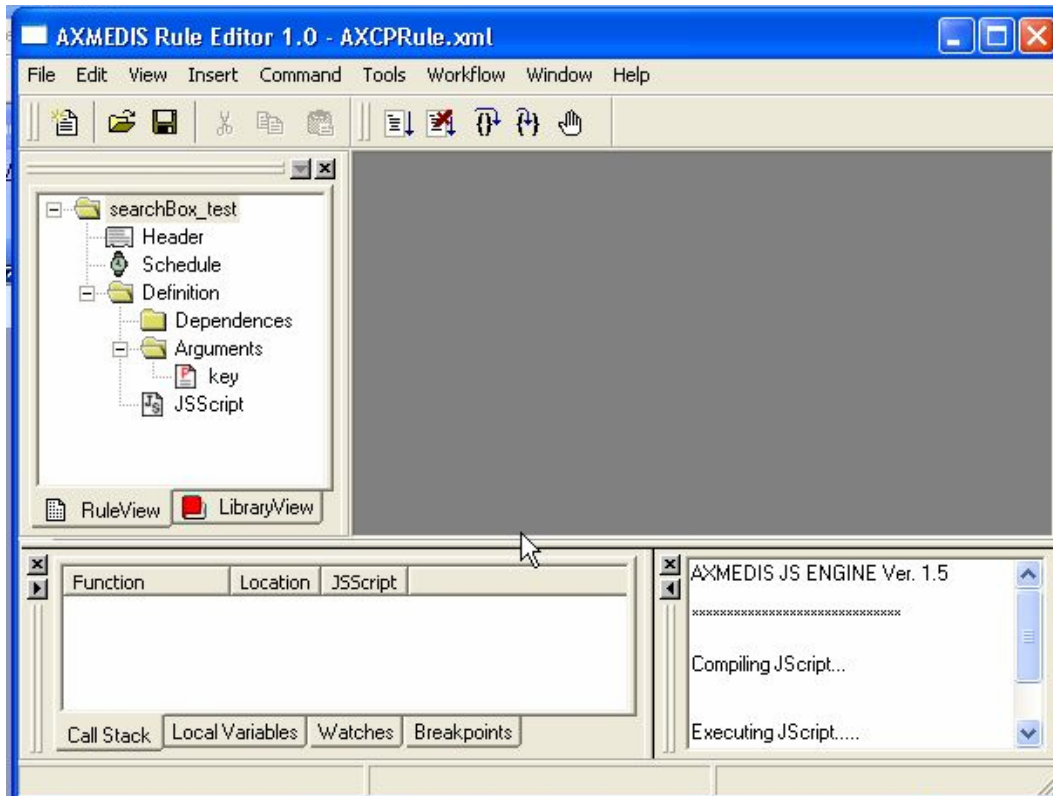


Figure 46: “RuleView”, “LibraryView”, and “Help” windows in the AXMEDIS Rule Editor 1.0

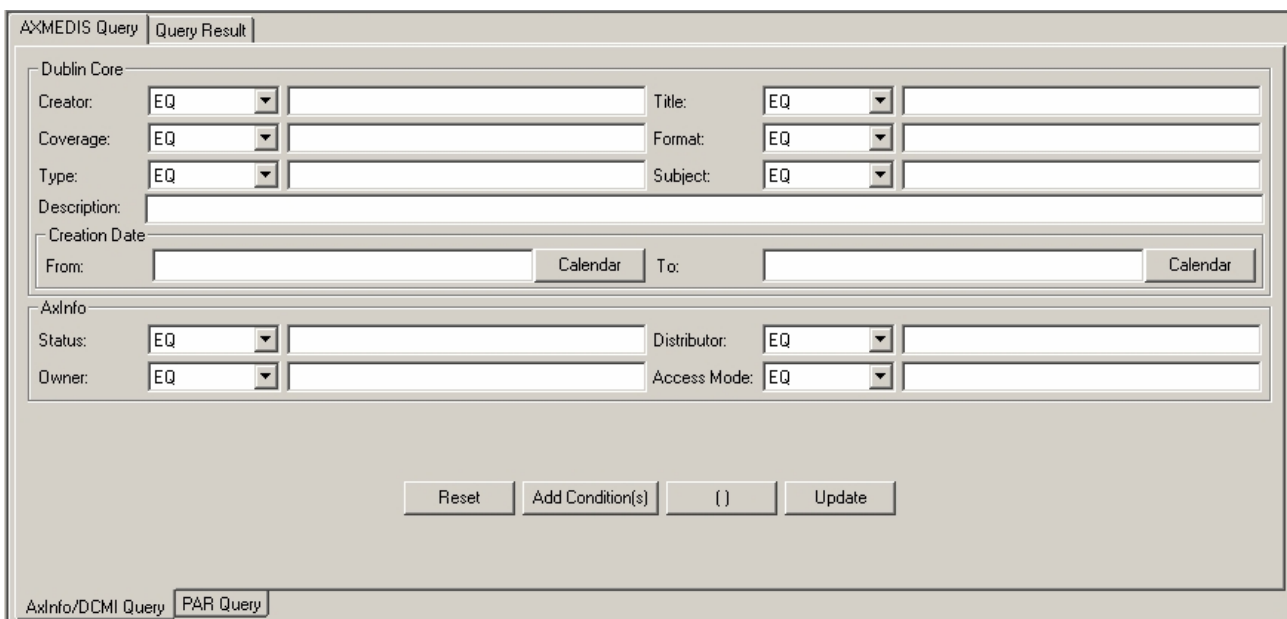


Figure 47: “Selection Editor” window

Many windows can be open at the same time and not all of them may be visible. Compare Figure 49 with 50. In Figure 49 several JScript elements were opened in the “Workspace” window one on top of the other. The windows are visible in Figure 50 after selection of “Window → cascade”. A better solution may be to open windows in a cascading way by default.

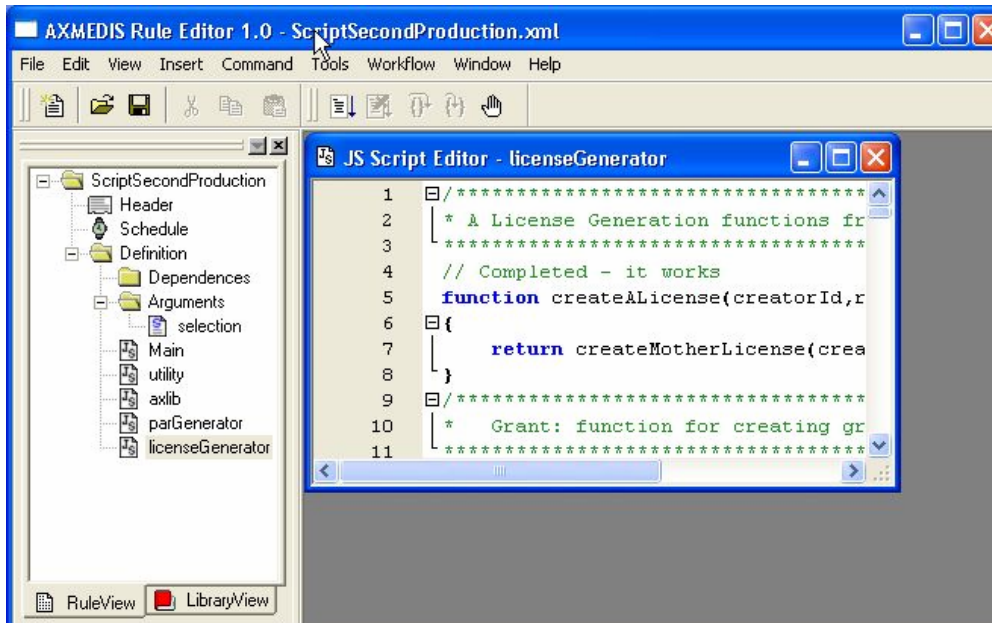


Figure 48: It is not visible that all JS Scripts are open and overlap each other.

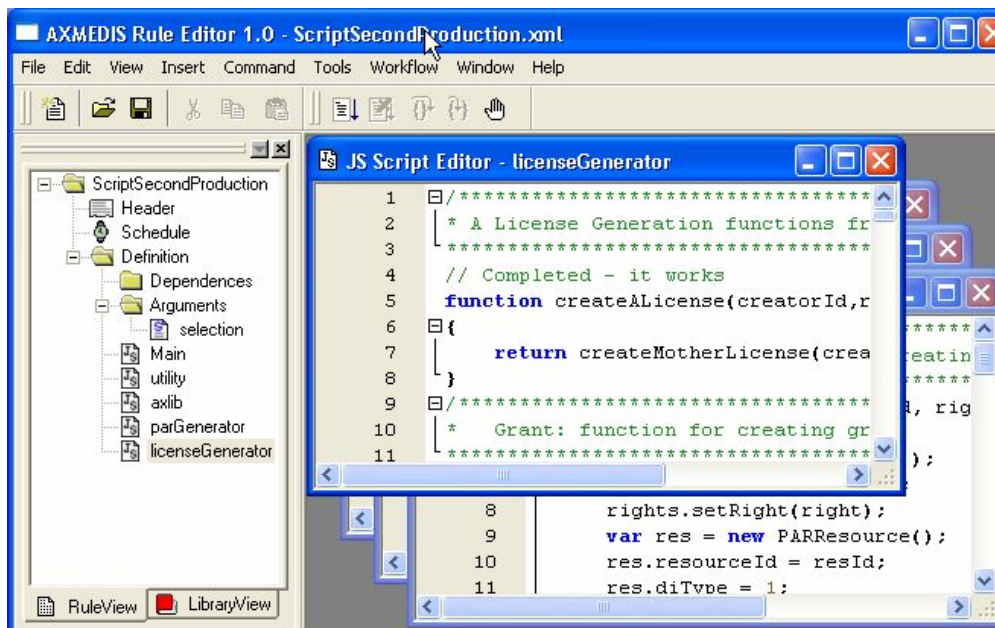


Figure 49: In cascading mode several open windows are visible.

**Unnecessary icon.** When the Selection Editor is open an icon is displayed in the left top menu bar (Figure 51). This does not improve visibility of system state. The information [Selection Editor] in the head line is much more informative and sufficient.

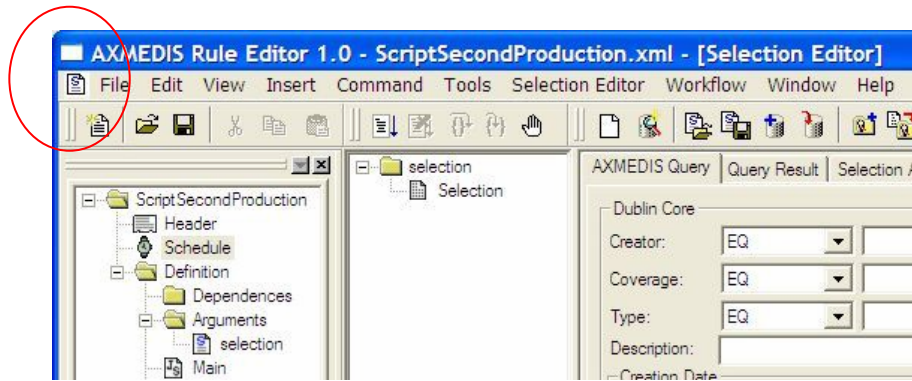


Figure 50: The icon in the red marked circle appears when the Selection Editor is open.

**Context menus and their relationship with commands in the menus of the top menu bar and in the tool bar.** The selection of “Command → Debug → Go” in the top menu bar seems to start the same operation as the selection of the Debug icon labelled “Start Debug” or right click to a JScript element and the selection of “Debug” from the context menu. This may confuse a user. Use a consistent name like “Start debug” in all three locations.

If a rule contains more than one JScripts it is not visible in the output window if all JScripts are debugged at the same time or only one, e.g. the selected, script. The output window presents the message “Executing JScript...”.

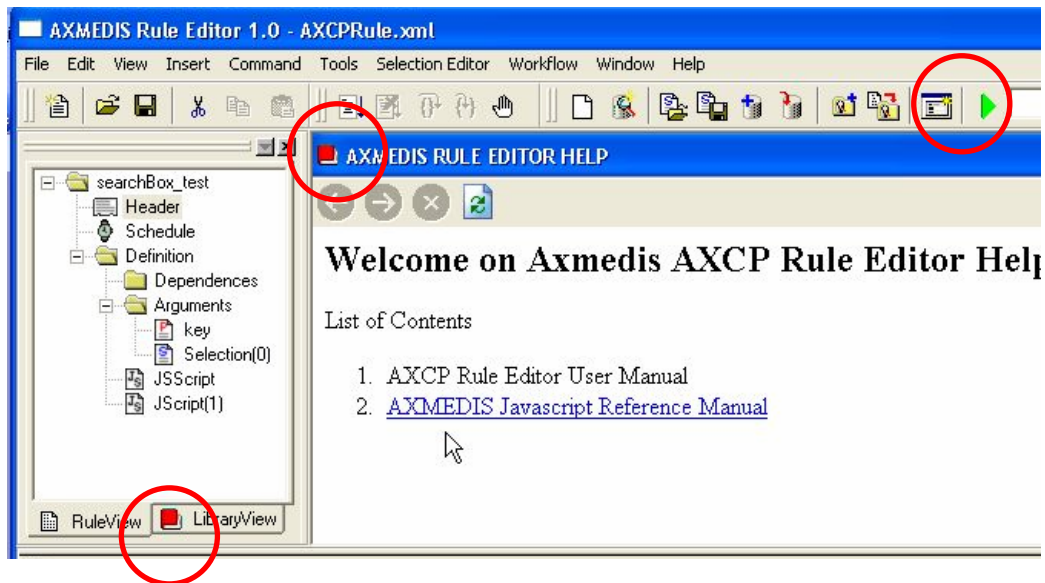
It is not evident how the elements of a new rule can be edited. It may be helpful if all commands which can be selected from a context menu were also provided in a menu in the top menu bar.

**The relationship between icons and commands in menus is not visible.** The menus list commands together with their shortcuts. Visibility will be increased if all the menus show the icons related to the commands. Figure 52 illustrates the “Debug ...” sub menu where this relationship is visible.



Figure 51: “Command” menu and “Debug ...” submenu in AXMEDIS Content Processing Rule Editor

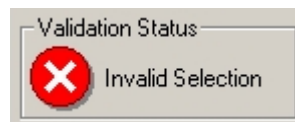
**Unnecessary use of icons and use of spectrally extreme colors for icons and buttons.** “Rule View” and “Library view” each have an icon before the title and there is also an icon in the header of the “Help” window (Figure 53). These icons neither add to visibility nor to the meaning of the title. Better remove the icons.



**Figure 52: Unnecessary use of icons with spectrally extreme colors (e.g. “Library View”).**

The red color of the icon before “Library View” and the icon in the header of the “Help” window is inappropriate. The use of green and red colours for the “Back”, “Forward”, “Close” icons in the “Help” window is not appropriate and neither is the green colour of the “Test Query” icon. Avoid the use of spectrally extreme colours except for visual cues to attract attention, alert the user or to stop the user doing something.

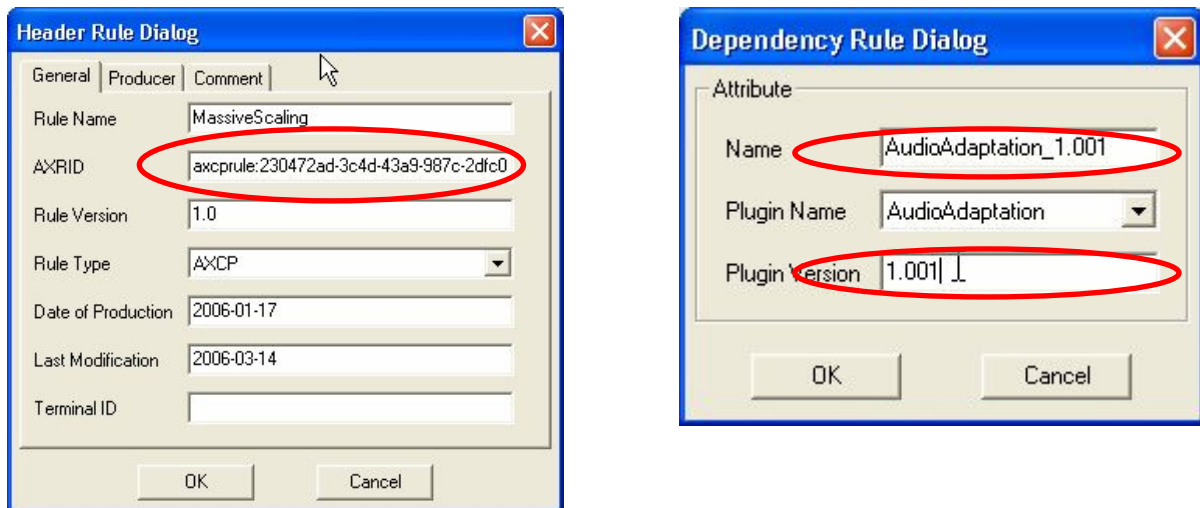
A good solution is the use of colour to show the “validation status”: red colour = invalid selection (Figure 54), green colour = valid selection.



**Figure 53: Display of Validation Status**

**Missing visual feedback for read-only fields in dialog windows.** Some elements in dialog windows are read-only. Grey out the read-only fields in dialog windows (make it consistent with read-only input fields in dialog windows of the other AXMEDIS tools).

Read-only fields (Figure 55) are “AXRID” in “Header Rule Dialog” window and “Name” and “Plugin Version” in “Dependency Rule Dialog”.



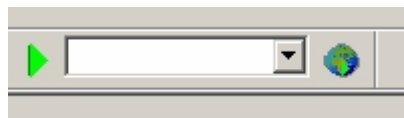
**Figure 54: Read-only fields in “Header Rule Dialog” and “Dependency Rule Dialog” are invisible.**

**Processing.** Loading and saving of resources and objects can take time (sometimes several seconds) and this is not visible. A delay indicator icon showing that the system is processing is needed.

**Progress of a task is not visible.** When the user creates a new rule or edits a rule it is not visible how much of the work has been done and what else needs to be done. Context maps or procedural maps which show the progress of work may be helpful.

### 3.3.7.2 Match between the system and the real world

**Some icons are not concrete, not meaningful, and not familiar to the user.** “Test query” and “Test selection” icons are not meaningful. It is better to avoid the design of icons for abstract concepts such as “Test query” and “Test selection” (Figure 56). Use a button with the name instead.



**Figure 55: Icon to the left: “Test query” and icon to the right: “Test selection”**

**Menu names do not communicate.** Command names in some of the menus in the top menu bar do not match their corresponding menu titles. E.g. the “Command” menu contains commands as do the other menus. A meaningful menu title is needed such as “Debug” or “Extras”. Another example is the “Insert” menu which may be mistaken for the “Edit” menu.

**Dialog windows with data entry forms.** Field labels in the data entry forms of dialog windows and of the selection editor contain AXMEDIS specific, technical language. It is not obvious whether all fields must be completed in a data entry form, which fields are optional or obligatory to complete. Context specific online help with definitions of the technical terms may be helpful. Use less technical terminology in dialog windows, make read-only parts visible. Add on-line help which explains what the user is supposed to do.

**“Tab forward” in data entry forms works but sometimes not top down and from left to right.** This is the case in the “Selection Editor”.



**Terminology.** A non technical user will not understand the meaning of the buttons (Figure 57) in the “Selection Editor” window.



Figure 56: Buttons in the “Selection Editor” window

**Typing errors.** Replace the typos described in Figure 58.

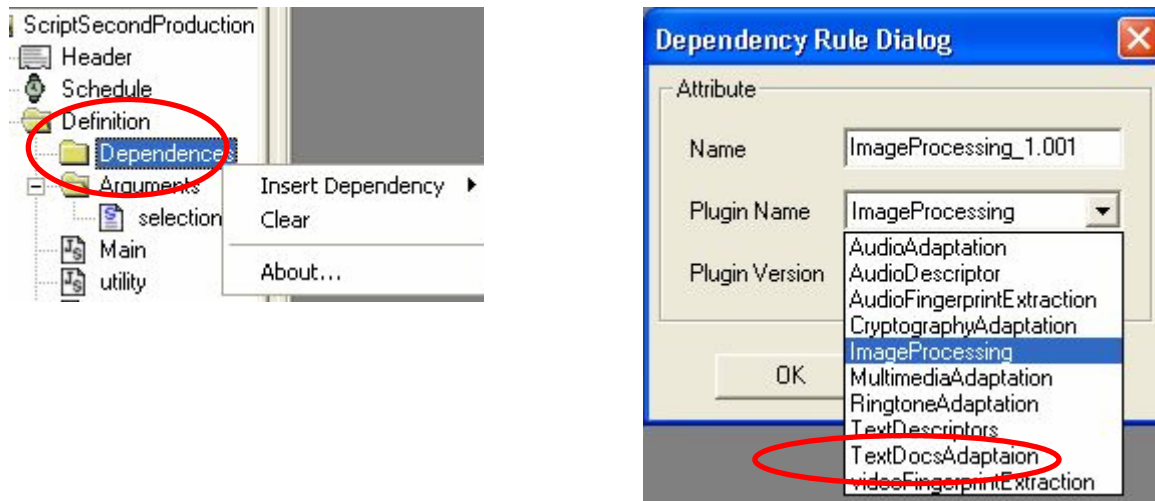


Figure 57: Replace the typos marked with red circles.

### 3.3.7.3 User Control and Freedom

**“Undo” and “Redo”** can be applied when editing JScripits. Multiple “undo/redo” is possible, however, it is not visible how often one can trace back and forward.

**Arrangement of Windows.** “Tile horizontally” and “Tile vertically” seems to work with up to three open windows only. If the number of open windows is larger then windows are arranged vertically and horizontally at the same time.

**Set properties.** It would be helpful if users could define their own session properties for windows to be open at the start of the tool and for the default arrangement of open windows (e.g. cascading style).

### 3.3.7.4 Consistency and Standards

**Inconsistent use of tool name in different locations** (see Appendix). Be consistent and use the same name for the tool in different locations.

**Inconsistent use of “Help → About” in different tools** (see Appendix). Be consistent with the other AXMEDIS Tools. A shortcut for “Help → About” is not needed, because this command will not be used frequently.

**Inconsistent style of icons used in different AXMEDIS Tools.** “Open from Database”, “Upload into Database” still look different in the AXMEDIS Content Processing Editor, AXMEDIS Editor, and DRM Editor (Figure 59).






	Cont Proc Editor	Editor	DRM Editor
Open from Database	 Open from Database	 Open from Database	-
Upload into Database	 Upload into Database	 Upload into Database	 Save

Figure 58: Inconsistent style of icons

“Back”, “Forward”, and “Close” icons in the “Help” window are larger compared to other icons (Figure 60). Two different “Close” icons in the “Help” window unnecessarily overload the user. “Close” and “Refresh” icons in the “Help” window do not work. Agree and use a consistent style of icons for all AXMEDIS tools.

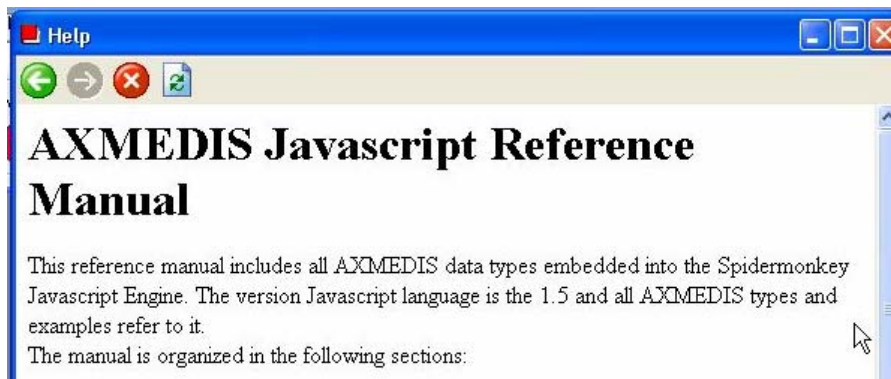





Figure 59: “Help” window in the AXMEDIS Rule Editor 1.0


The style of icons for the “Selection Editor” (Figure 61) is not always consistent with the other icons and the design of some of these icons is not very clear: “Open Selection” and “Save Selection” icons are consistent with “Open rule” and “Save Rule” icons. Suggestion: Replace the icons for “Open from Database” and “Upload into Database” icons with those from the AXMEDIS Editor and also adapt “Import Query” and “Export Query” icons to this solution.



Figure 60: Icons in the AXMEDIS Content Processing Editor 1.0

The  “Clear Selection” icon is too similar to the  “New Rule” icon .

The “Customize Query Panel”  icon is not meaningful and not yet implemented. It seems to be sufficient if this command appears in the menu of the “Selection Editor” only. If users require a button better use the name “Customize Query Panel” instead of the picture.

The yellow star in the “Add new Query”  icon is almost invisible and does not contribute to a better understanding of the meaning.

The correct name for the “Insert Breakpoint”  icon is “Insert/Remove Breakpoint” because it is a toggle which first inserts a breakpoint and if it finds a breakpoint in place it removes the breakpoint.

**Inconsistent location of icons.** In both “Output” and “Debug Monitor” windows the “Close” icon is located in the top left corner while in the other windows the “Close” icon is in the top right corner. Let the “Close” icon always appear in the top right corner.

**Inconsistent terminology.** The selection of “View → Preferences” opened a “Configuration” window. Since version 2.6.5 the name of the window has changed to “Preferences” window. This is still inconsistent with the AXMEDIS Editor and other tools where the name for this function is **Inconsistent name and location for “Configuration” information**. Be consistent with other tools.

Editor	Menu Selection	Title of dialog window
AXMEDIS Content Processing Editor	View → Preferences	Preferences
AXMEDIS Editor	File → Configuration	Configuration
AXMEDIS Programme and Publication Editor	File → Configuration	Configuration
AXMEDIS Player	File → Configuration	Configuration

Figure 61: Inconsistent name and location for “Configuration” information

### 3.3.7.5 Help Users recognize, diagnose, and recover from errors

**Wrong entries in data entry forms.** The AXMEDIS Content Processing Editor does not seem to detect wrong entries in data entry fields nor does it highlight or explain them for the user.

**(Error) Messages.** The response to a wrong selection of a command is shown in Figure 63. The term “error” may not be adequate and annoy the user. Inform the user in a more friendly way: “Message: Select or create a query before adding conditions”.

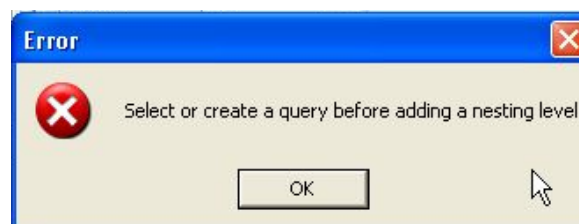


Figure 62: Message

**Vague error messages from the debugger.** An argument “input path” was defined. The error message coming from the debugger “input path is not defined” is not very helpful because it does not mention the rules for defining the input path, eg. use one word “input\_path”.

### 3.3.7.6 Error Prevention

After closing a file the “Selection Editor” menu is sometimes still visible in the top menu bar (sometimes “Selection Editor” is even displayed twice) and commands from this menu can be selected (Figure 64).

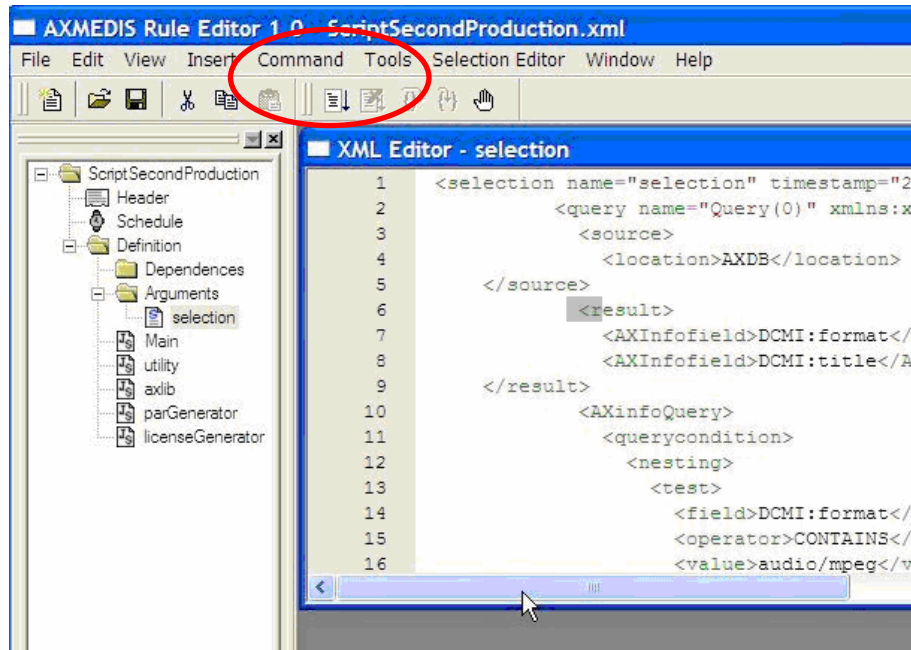
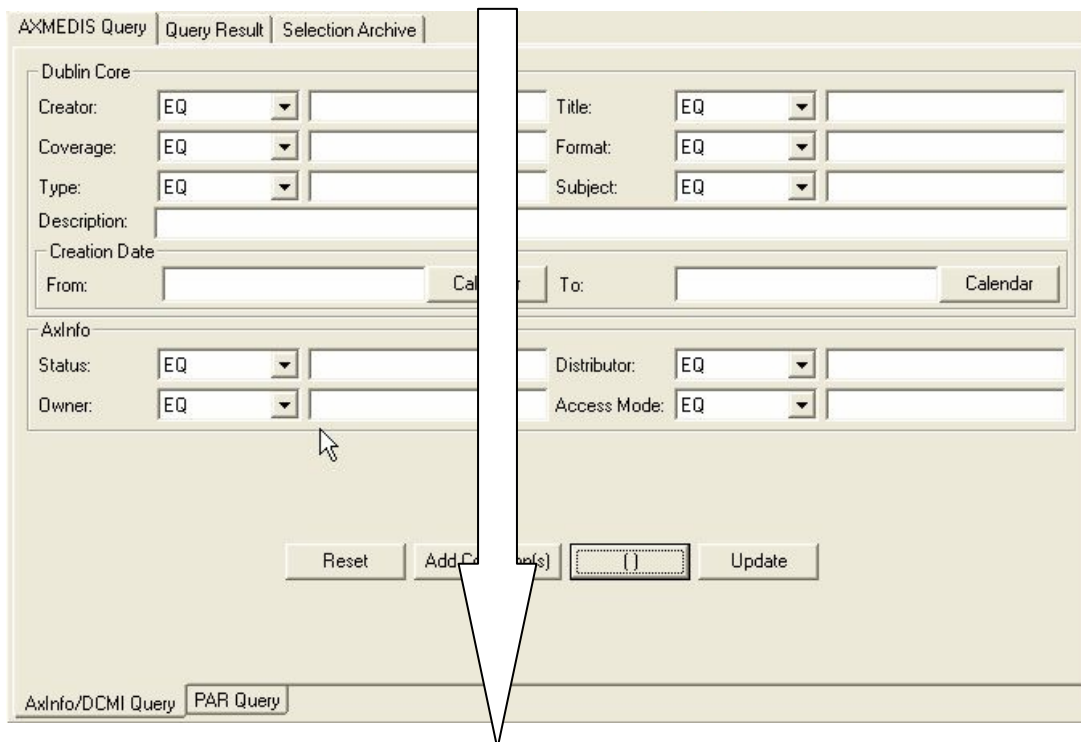


Figure 63:

### 3.3.7.7 Recognition rather than Recall

Data entry forms (e.g. "AxInfo/DCMI Query" and "PAR Query" in the Selection Editor) have two or more columns with data entry fields. The field labels of the right column are very close to the data entry fields of the left column. Increase the space between the two columns (Figure 65). If there is no reason why data entry fields are arranged in two or more columns and if there is sufficient space to arrange all fields one below each other, then this is desirable.



**Figure 64:** The arrow indicates where more space between input fields on the left and field labels on the right is needed.

### 3.3.7.8 Flexibility

**Shortcuts.** A large number of keyboard shortcuts are provided (see Appendix). It is questionable whether all shortcuts are needed. Shortcuts are used to enable experienced users to speed up their work. However, when there are many shortcuts it will be difficult for a user to remember and to distinguish them. Provide shortcuts for frequently used commands only. Compare with standard software, where shortcuts are mainly offered for commands in the “Edit” and “File” menus.

**Shortcut assignments** are not consistent across AXMEDIS tools. Be consistent with other tools.

### 3.3.7.9 Aesthetic and Minimalist Design

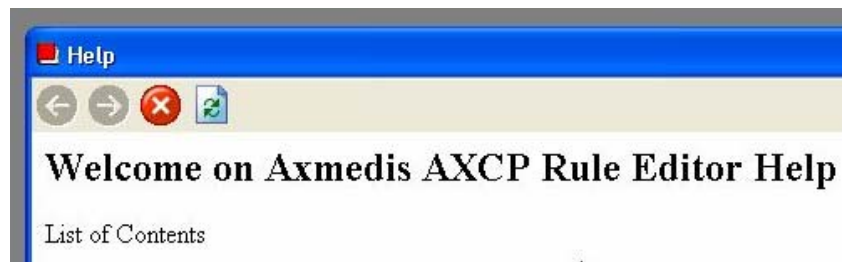
**Icon design.** These icons are neither visually nor conceptually distinct:



**Figure 65:** Icons in the Selection Editor

### Help and Documentation

**“Help” window.** The title “Welcome on Axmedis AXCP Rule Editor Help” is not needed in this window and “Contents” is sufficient instead of “List of Contents”.



**Figure 66:** “Help” menu in the Axmedis Content Processing Rule Editor

Suggested changes to be more consistent with the other AXMEDIS Tools:

“Help → User Manual” should lead the user to the window with the User Manual.

“Help → Javascript Reference Manual” should lead the user to the window with the Javascript Reference Manual.

“Help → About Content Processing Rule Editor” should lead the user to a window with information about the tool (as provided in the other AXMEDIS Tools)

**Some On-line Help is provided**, eg. (Javascript Reference Manual) via “Help → About”. The On-line “User Manual” is not implemented yet.

**On-line instructions** which guide the user are missing (eg. completion instructions for data entry forms and for dialog boxes, simple examples for jsript creation).

**Data entry forms.** Field labels in data entry forms are not always familiar, brief, and descriptive. On-line instructions which show how to complete a data entry form may be helpful.

**User guidelines** are available and very helpful. The AXMEDIS Major Tools User Manuals is a pdf file which can be accessed from the AXMEDIS Tools start menu. It contains a chapter for the AXMEDIS Content Processing Rule Editor with the description of the functionality and screen dumps. Very helpful is a tutorial with three task oriented descriptions of how to create rules. The “Configuration” window is described in detail, although it does not describe all possible modules (e.g. descriptions of WORKFLOW\_PENDING\_AXRQID, MOZILLA\_BROWSER, AXCSOBJREG, and PMSCLIENT) and parameters (e.g. HELP\_PATH, FTPPath). The AXMEDIS Content Processing Script Language is available as pdf file.

The “Command → Find Rule ...” button in is not yet implemented.  
The “update” button in the “Selection Editor” window is not yet implemented.

### 3.3.8 Metadata Mapper

The Metadata Mapper was provided separately and inspected. It does not seem to be included in the AXMEDIS Tools.

#### **Visibility of system status**

**Many commands and icons cannot be applied in specific system states.** For example “Save XSL”, “Save Transformed File”, “Clear all nodes”, etc and the related icons can be selected even when no file is open. The result of using these commands then is often a crash of the programme. Grey out commands and icons in system states where they cannot be applied to increase visibility for the user and to help the user recognize commands which can be applied in a specific state.

**The relationship between icons and commands in menus is not visible.** The menus only list commands but not the icons related to these commands. Visibility will be increased if all the menus show the icons related to the commands, e.g. “Open Source”, “Open Destination”.

**Windows do not have titles.** Window titles will add to visibility and may contribute to self explanation of the programme. Add titles at the top of the windows, for example “Source”, “Mapping”, “Destination”, or “Source Metadata”, “Mapping”, “Destination Metadata”.

**Name of open files should be visible** to avoid user errors. Make the names of the open Source and Destination files visible, if possible in a way which is consistent with the other AXMEDIS Tools, by adding the file names to the headline of the window:

AXMEDIS MetaData Mapper v.1.0 – Source: sourcename – Destination: destinationname
---

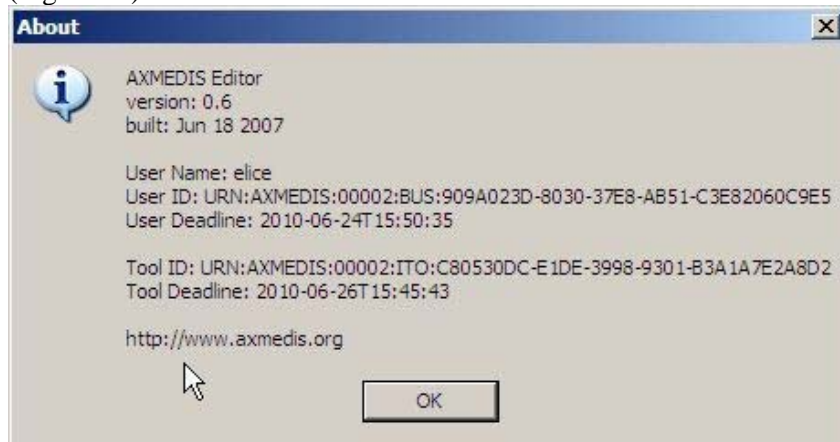
**How to delete a single connection is not immediately visible.** It seems to me that you can only do this by selecting the destination node and using delete from the context menu. However, I first tried selected one destination node and applied “Process → Disconnect selected nodes” from the menu. As a result several connections were deleted.

#### **Match between the system and the real world**

**Terminology.** Users may not be familiar with some of the terminology used in the Metadata Mapper, eg. “Save XSL” or “Save XSLT”. The terms “Source” and “Destination”. Open Source, Open Destination. *Use the same terminology in different locations.*

## Consistency and Standards

**Inconsistent Help.** Provide Help in a way which is consistent with the other AXMEDIS Tools. Regarding the dialog box which opens when you select “Help → About ...” use the solution implemented in the AXMEDIS Editor (Figure 67).



**Figure 67**

Regarding “Help → Index” I suggest that you choose a more precise name, for example “Getting started” if the help information is supposed to be brief (as it is now). When you later add an index you can add a “Help → Index” command, or “Help → Guidelines” if you intend to put the guidelines from the user manual online.

“Help → Index” opens a dialog box with the title “MetaData Mapper” (Figure 68). To be consistent with other AXMEDIS Tools use as the title in the dialog box the command, which was selected from the menu, eg. “Help → Index”. However, the term “Index” does not make sense here. It may be better to name the command “Getting started” and to provide more precise explanations, eg:

“Open a file (or open from database) containing the source metadata and another one containing the destination metadata.”

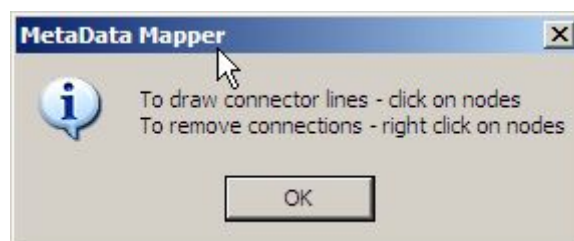
Create metadata mappings by selecting an element each from the “Source Metadata” view and from the “Destination Metadata” view.

The first, source metadata selection, should contain an instance of the metadata you want to transform from (source metadata language), the second, destination metadata selection should contain an instance of the metadata you want to transform to (destination metadata language).

Save the mapping information to a XSLT file.

“Save the transformed file” to file.

Consult the user manual for more detailed guidelines.”

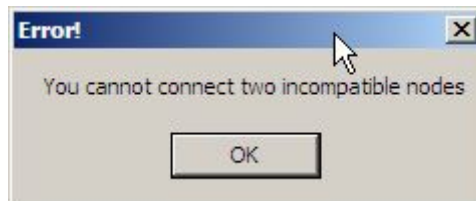


**Figure 68**

**Inconsistent terminology.** Do the command “Save XSL” and the icon “Save the xslt” have the same function? If so, please use the same terminology in both places in order not to confuse the user. The same holds true for the command in the File menu “Save Transformed File” and the related icon “Save the transformed file”, and for other commands in the file menu and there related icons.

### **Help Users recognize, diagnose, and recover from errors**

**Error messages are not meaningful.** Sometimes the following error message appears (Figure 69). It may be more helpful for the user to the call the message “Warning!” instead of error and to explain why the two selected nodes are not compatible.



**Figure 69**

### **Flexibility**

Deletion of either a single connection or of multiple connections may be desirable, because this will speed up work. As the editor is implemented now, it is much easier to accidentally delete several connection at once than one selected connection. See also descriptions under visibility above.

### **Help and Documentation**

**User guidelines** are available and very helpful. The AXMEDIS User Manual contains a brief chapter for the AXMEDIS Metadata Mapper with a task oriented description including screen dumps.

**On-line help.** Little on-line help is provided. It would be good to have the Metadata description from the AXMEDIS User Manual on-line. Instructions which guide the user are missing.

## **3.3.9 AXMEDIS Content Processing Rule Scheduler**

### **Visibility of system status**

No defects found.

#### **3.3.9.1 Match between the system and the real world**

**Menu title does not communicate.** Commands of the “Commands” menu do not match their corresponding menu title, because all menus contain commands. Use a more precise name, e.g. “Rule management”.

#### **3.3.9.2 User Control and Freedom**

No defects found.



### 3.3.9.3 Consistency and Standards

**Inconsistent use of tool name in different locations** (see Appendix). In the AXMEDIS Major Tools User Manuals the tool is called “AXMEDIS Rule Engine – Rule Scheduler (p. 96). The AXMEDIS Tools start menu calls it AXMEDIS Content Processing Rule Scheduler, and the title bar of the tool shows the name “AXMEDIS – Rule Scheduler”. This is confusing for users. Use one name for the tool in different locations.

**Inconsistent use of shortcuts in different tools** (see Appendix). Avoid using shortcuts which have a different function in other tools. A shortcut for exiting a tool is not needed, because this command is not used so frequently.

**Inconsistent command names.** The help menu of the AXMEDIS Rule Scheduler is called “?” menu. The other AXMEDIS Tools use the name “Help” menu. Be consistent with the other tools and change the “?” menu into “Help” menu.

The “Help” command in the “?” menu does not work.

The “About” command in the “?” menu opens the following dialog (Figure 70). Change the name “?” to “Help” and implement in this “Help” menu a command “About AXMEDIS Content Processing Rule Scheduler “ which opens a window with content that is consistent with the other tools (see Appendix).

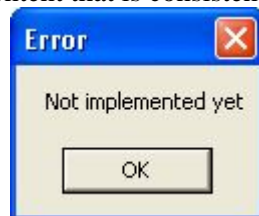
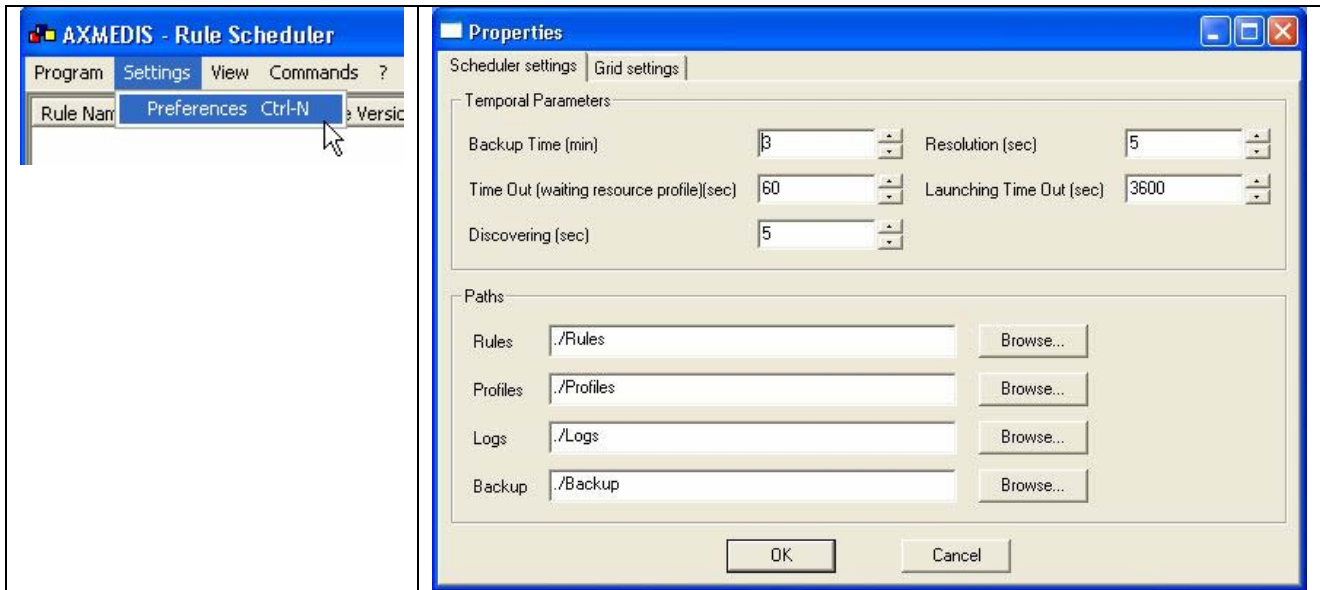


Figure 70

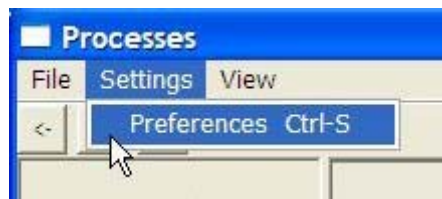
**Inconsistent names of commands and windows.** The selection of “Settings → Preferences” opens a “Properties” window where “Scheduler Settings” and “Grid Settings” are defined (Figure 71). The use of different names (settings, preferences, properties; and in other tools configuration) are confusing. In addition, there is no reason to provide a menu with just one command in it. Above all, the AXMEDIS Major Tools User Manual (pdf file) describes on page 101 “Configuration Parameters” and possible values in the “Properties” window.

Use a single name “Configuration” (to be consistent with the other AXMEDIS Tools) and get rid of the names “Settings”, “Preferences” and “Properties”.



**Figure 71: The selection of “Settings → Preferences” (above) opens the “Properties” window (left)**

**Inconsistent names of commands and windows.** “View → Processes” opens a “Processes” window where another “Settings → Preferences” command (different to the one described above) can be selected which opens a “Preferences” window. Use a single name (as above).



**Figure 72: The selection of “Settings → Preferences” in the “Processes” window.**

**Inconsistent commands provided to close a window.** In the “Processes” window the command “File → Quit” closes the window. In the “Debug Monitor” window it is the “Log → Close” command. Be consistent.

**Help Users recognize, diagnose, and recover from errors**

Dialog windows occur in this tool which are titled “ERROR” although the window contains a message only. Treat users friendly and provide in the title of windows the name of the command which was selected, in this case “About”. Distinguish between “Message”, “Warning” and “Errors”.

**Recognition rather than Recall**

No defects found.

**Flexibility**

No defects found.

**Aesthetic and Minimalist Design**

No defects found.

## Help and Documentation

**On-line help** is not implemented yet.

**User guidelines** are available and very helpful. AXMEDIS Major Tools User Manuals (pdf file) can be accessed from the AXMEDIS Tools start menu. The chapter about AXMEDIS Content Processing Rule Scheduler contains a description of the functionality with screen dumps.

A more task oriented description or a short tutorial which describes a scenario of how to schedule rules would be good.

### 3.3.10 AXMEDIS Programme and Publication Editor

#### Visibility of system status

**Name of an open file is not visible.** It is not immediately understandable and visible that several files can be opened and are shown in the tree hierarchy window. A new user may become aware of this fact only after the use of “New” and when opening the parameters window for a prog&pub file which shows the name in the header of the window. This could be made clearer by changing the root name of the tree hierarchy from “AXMEDIS PnP Programmes” to “AXMEDIS Prog&Pub Files”.

**Windows do not have titles.** The three windows do not have titles. Provide a title in the top left corner of each window, e.g. “Programme workspace”, “Programme window”, “Output”.

**Inconsistent location of icons.** The “Close” icon is on the left side of the “Output” window. Move “close” icon to the top right of the window to make it consistent with all other tools.

**Width of windows.** The “PnP Repository List Dialog” window (Figure 73) is not wide enough. The width of the columns in the dialog window can be changed but the width of the window itself cannot be adapted. A wider window showing the “PnP repository list dialog is desirable so that more content is immediately visible.

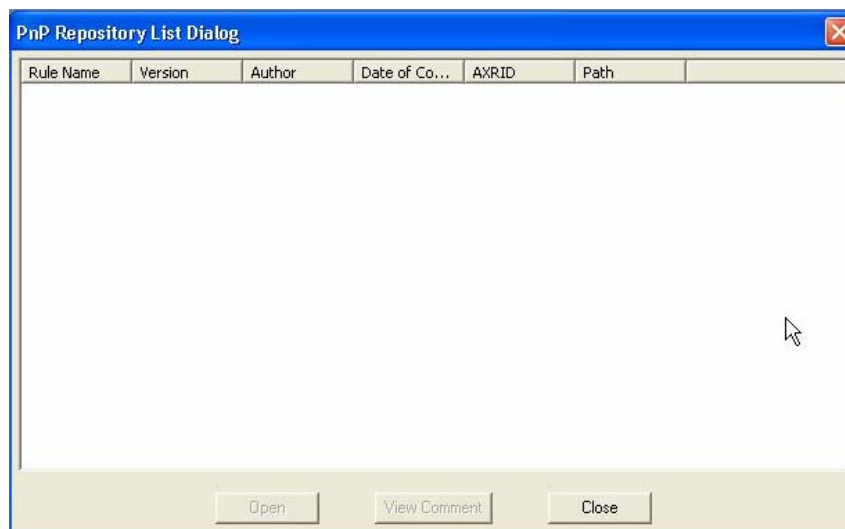
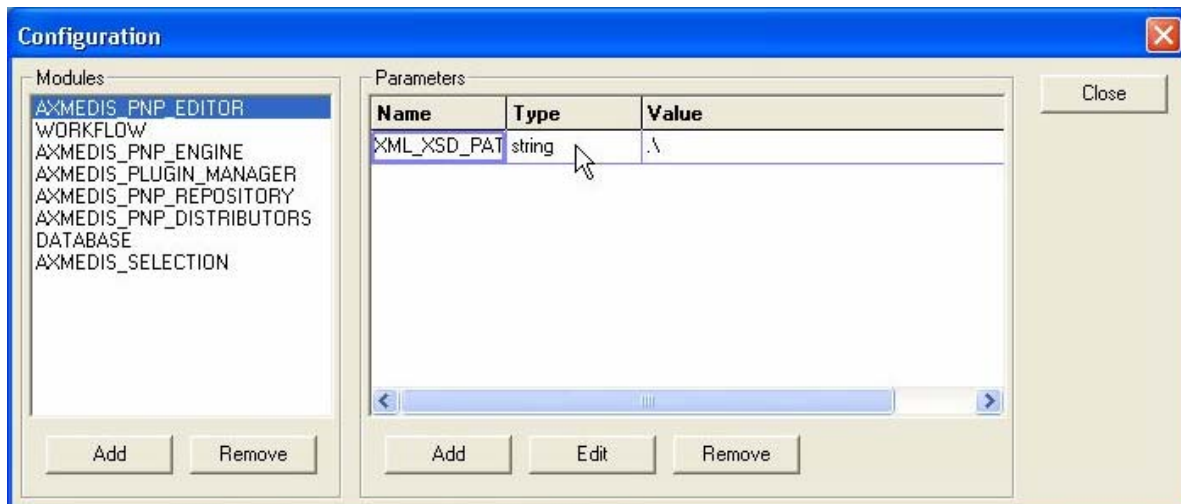


Figure 73: PnP Repository List Dialog

### **Match between the system and the real world**

**“Configuration” window.** Non-technical users will have difficulties to understand what needs to be inserted in the “Configuration” window. The “User Guide for the Programme and Publication Area” provides some information, but a naïve user may find it difficult to configure the AX-PnP-Engine. E.g. setting the port number. Where do you get the port number?



**Figure 74: “Configuration” menu**

### **User Control and Freedom**

**Undo/Redo** commands are not available.

**User properties.** When the tool is started and a file is open there are always all views (workspace, output, programme) are open. It may be helpful if users can set and store their own session properties.

### **Consistency and Standards**

**Inconsistent use of tool name in different locations** (see Appendix). Make the name of the tool used in different places consistent for all tools. The best solution seems to be the one for the AXMEDIS Editor.

**Inconsistent style of icons.** The icon design is not always consistent with other AXMEDIS Tools. In the AXMEDIS Programme and Publication Editor the name of icons is always visible below the icon. This is not consistent with the solution in all the other AXMEDIS Tools, where the name of an icon appears with mouse-over. Be consistent and use the style of icons which is used for the other AXMEDIS tools.

### **Help Users recognize, diagnose, and recover from errors**

No defects found.

### **Recognition rather than Recall**

Field labels are not always familiar, brief, descriptive. On-line help may be needed.

## Flexibility

“Expand” / “Collapse” commands may be useful to quickly navigate through large programme hierarchies.

**Windows arrangement.** A shortcut for “Window → Next” and “Window → Previous” may be desirable.

**Shortcut assignments** are not consistent across AXMEDIS tools (see Appendix). The shortcut for the “Exit” command (Ctrl+X) is not consistent with the shortcuts provided for “Exit” in other tools (Alt+X).

## Aesthetic and Minimalist Design

“About ...” command is not needed in context menus. The “About ...” command appears in all the context menus. It is sufficient to have this command in the top menu bar: “Help → About ...”.

**Menu titles do not communicate.** Commands of the “Command” menu do not match . not just the “Command” menu. Use a more precise name, e.g. “Extras”.

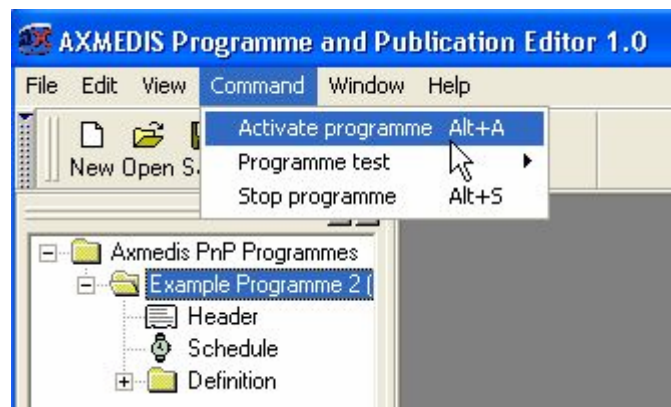


Figure 75: “Command” menu

“View” menu title does not communicate / “View” commands with different functions. Either selecting “View” from the context menus in the hierarchy tree, or clicking to the “View” icon in the tool bar, or selecting “File → View Programme” from the top menu bar open a dialog window with the parameters related to the selected programme. “View → Toolbar”, “View → Workspace” and “View → Output” are used to open spaces on the screen which have been closed by accident. The commands “View Programme”, “Toolbar”, “Workspace”, “Output” may be better located in the “Window” menu.

### 3.3.10.1 Help and Documentation

**On-line help** is not implemented yet.

**User guidelines** are available and very helpful. The AXMEDIS User Manual contains a chapter for the AXMEDIS Programme and Publication Editor with the description of the functionality and a task oriented description. A detailed description of the “Configuration” window is missing.

### 3.3.11 AXMEDIS Programme and Publication Engine Monitor

#### ***Visibility of system status***

No defects found.

#### ***Match between the system and the real world***

No defects found.

#### ***User Control and Freedom***

No defects found.

#### ***Consistency and Standards***

**Inconsistent use of command for leaving the tool.** Change the command “Quit” to “Exit”.

#### ***Help Users recognize, diagnose, and recover from errors***

No defects found.

#### ***Recognition rather than Recall***

No defects found.

#### ***Flexibility***

No defects found.

#### ***Aesthetic and Minimalist Design***

No defects found.

#### ***Help and Documentation***

**User guidelines** are available and helpful. The AXMEDIS User Manual contains a brief chapter for the AXMEDIS Programme and Publication Engine Monitor with the description of the functionality.

### 3.3.12 AXEPTool version 3.2.23

#### ***3.3.12.1 Visibility of system status***

The catalogue lists AXMEDIS Objects and Non AXMEDIS Objects. The list of objects is long so that a first time user can not see that there are AXMEDIS objects and Non AXMEDIS Objects (Figure 76). Provide a link to both AXMEDIS objects and Non AXMEDIS objects at the top of the page so that the user can choose.

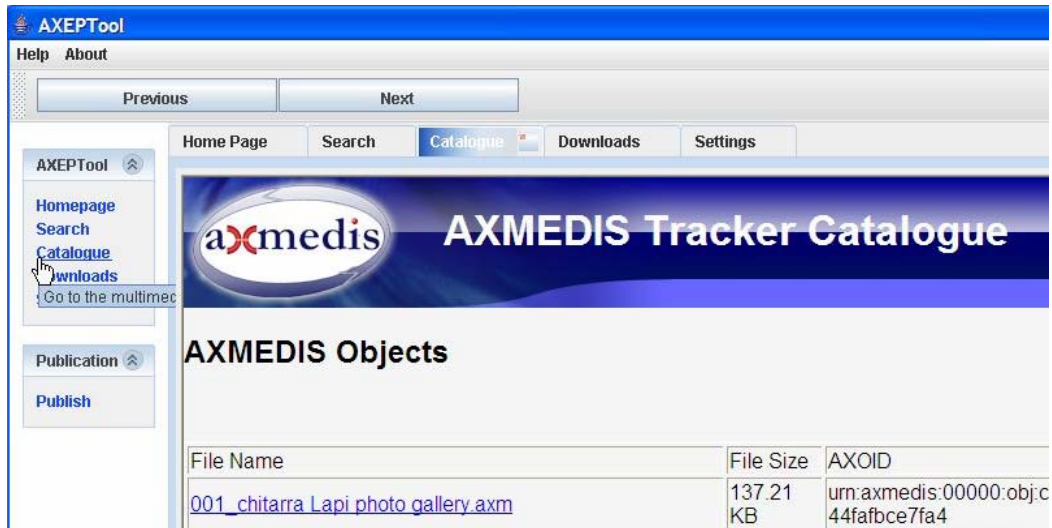


Figure 76

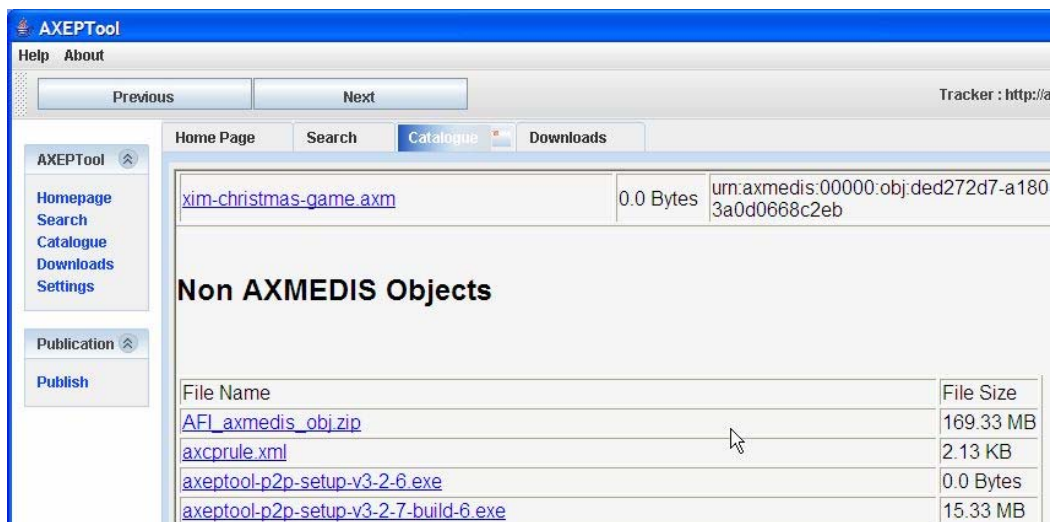


Figure 77

The selection of a link in the AXEPTool menu provides information about the selected link. However, this information is often cut off (Figure 4).



Figure 78

“Downloads” and “Settings” windows do not have a title such as “Homepage”, “Search”, “Catalogue”. Add a titles, e.g. for the downloads page “Downloads transfer list”.

### 3.3.12.2 Match between the system and the real world

Technical terminology needs to be explained. How can a user change these settings? E.g. which other tracker URLs can a user choose? The space below the input fields could be used for this.

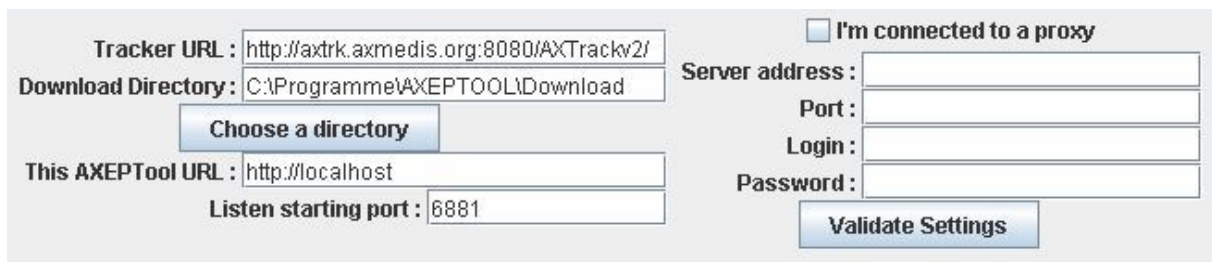


Figure 79

If you select the link “Homepage” you get the information “Go to your homepage”. However, when the link is followed – the AXMEDIS homepage is displayed, not the homepage of the final user.

“Catalogue” vs. „Go to the multimedia“ versus “AXMEDIS Tracker Catalogue”. Three different names are used to describe one issue. Better use the term “Go to the catalogue” and “AXMEDIS Catalogue”. Final users may not know the term “tracker”.

“Search” vs. “AXMEDIS P2P Query Portal”. Again two different names are used for one activity. Be more precise, e.g. with a title such as “Search with the AXMEDIS P2P Query Portal”.

**Two buttons in the Query Portal have Italian names:** InviaRichiesta, Azzera. Change these names into English language.

**Search is not self-explaining.** Search for metadata which do not exist yield the following page (Figure 80). A user may first assume that he did something wrong. But when he clicks to “Home” he is put back to the “Search” page. This is confusing.



Search was successful with the query definition “Creator” “equal” “AFI” and yielded a long list of results (Figure 81).

**Search results are not self-explaining.** If no results were found and the AXEPTool only feeds back an empty page with “Home” a user may expect that he has to follow the link to “Home” to see the results. On the other hand a link to “Home” could be interpreted as “go to the homepage”. Improve the explanations, e.g. call the page “List of search results”, replace “Home” by “Back to Search” or “Go back to Search”, and add a precise message “No results”, “No match”, or the objects found.



Figure 80



Figure 81

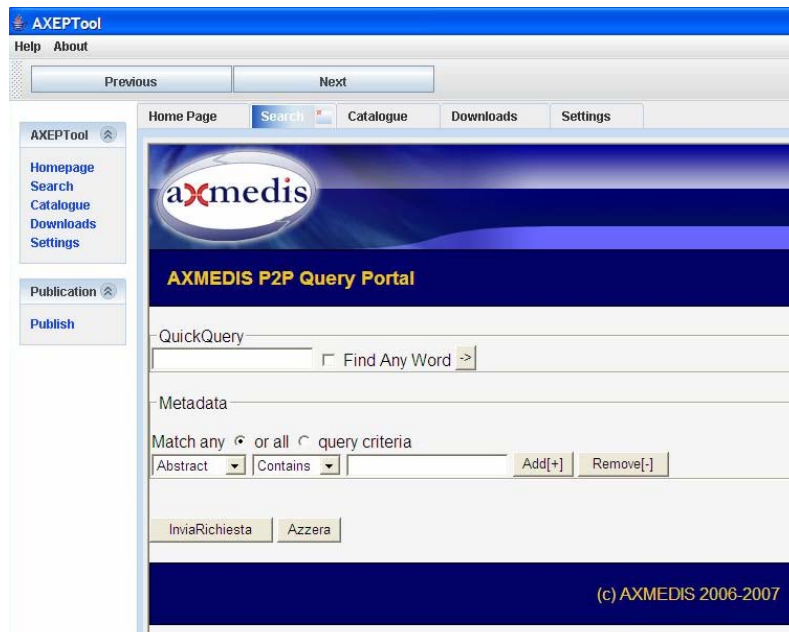


Figure 82

### 3.3.12.3 User Control and Freedom

No defects found.

### 3.3.12.4 Consistency and Standards

“Exit” command is missing.

The „Help“ and „About“ menus contain only one command. It is neither plausible nor inefficient that the same command appears twice (Figure 83). These two menus are not consistent with other AXMEDIS Tools (e.g. the “Help” menu of AXMEDIS Editor (Figure 8 right)).

Merge the commands into one menu:

Help



→ Guide to AXEPTool ...

→ About AXEPTool ...



Figure 83

Make “About” description consistent with AXMEDIS Tools (see appendix).

When several AXEPTool windows (homepage, search, catalogue, downloads) are open, the names of these windows are displayed at the top and the page which is open is marked with a little window icon. Click to this window button closes the window. It would be better to use  instead of  in the headline.

Inconsistent names are used in different locations. One example: “download media”, “delete file”, “remove this download”. Another example: “downloads”, “transfer list”. Try to use consistent names.

Inconsistent messages after “Remove” (Figure 84a) and “Remove and ...” (Figure 84b).

When selecting “Remove and ..” the question should be “Do you want to remove this download from the transfer list and ... In addition to the three options to delete, there should be “No” provided.

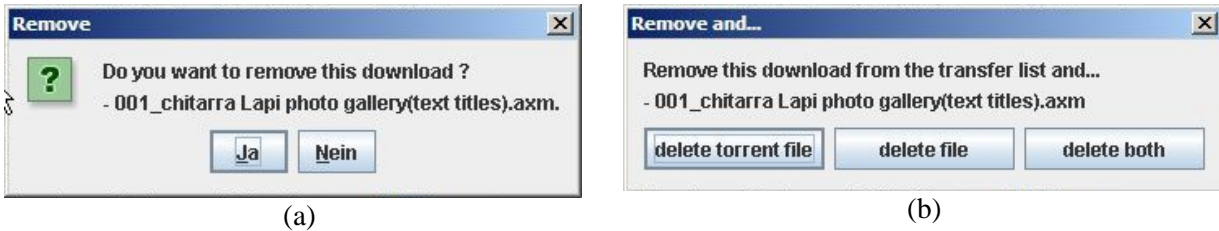


Figure 84

### **Help Users recognize, diagnose, and recover from errors**

No defects found.

### **Recognition rather than Recall**

Instead of “Choose a directory” it would be consistent with other tools to use the term “browse” and to move this button to the right of the “download directory” input field.



Figure 85: „Settings“ window

“Previous” and “Next” buttons (Figure 86) refer to previous and next page on the AXMEDIS portal. These buttons only work when the “Homepage” window is open. Either move these buttons to the “Homepage” window so that they are only visible when the “Homepage” is displayed, or grey out the buttons when the “Homepage” window is not visible.

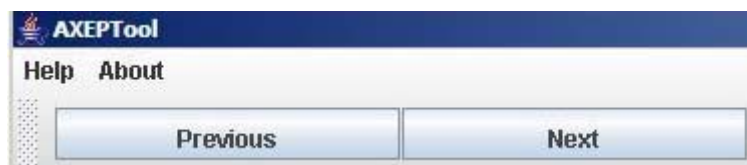


Figure 86

### **Flexibility**

Scrolling the long list of file is a bit tedious. Let the users browse through the list with pages and let the user decide the number of files to be displayed per page.

### **Aesthetic and Minimalist Design**

No comments.

### **Help and Documentation**

A user would prefer to get a page with online help and not the link of the AXMEDIS homepage (Figure 87). At least the precise link to help at the portal should be provided.



**Figure 87**

## 3.4 How usable are the AXMEDIS Tools? – Summary results

### 3.4.1 Implemented changes and achievements in the last six months

The overall stability of the tools has increased (less severe programme crashes). Visibility and consistency have been improved considerably. The terminology of tools has been improved.

Nevertheless the complexity of the AXMEDIS Tools has increased enormously in the last year and new deficiencies are visible which are reported in this chapter.

### 3.4.2 Proposed changes

A number of straightforward changes – feasible within the timescale and design constraints – are proposed to improve the AXMEDIS Tools without major restructuring of the tools:

Consistency is still a major issue:

- Make the style of used icons consistent in the AXMEDIS Tools
- Make data entry forms consistent within in the AXMEDIS Tools
- Make dialogue box naming consistent with menu items
- Use only one name for an AXMEDIS Tool in different locations

Terminology

- Get rid of technical terminology

Layout

- Use red and green colour for icons, text, etc. only, if you want to alert a user. Otherwise avoid the use of extreme colour.

Error Diagnosis

- Improve (error) messages. Be precise and distinguish between messages, warnings, errors. Provide user with error diagnosis and provide help for error recovery where possible.

Help

- The user manual provided as pdf file is good, but very comprehensive. It is tedious to search for help in this pdf file. Provide a good extract of the user manual as on-line help.

## 3.5 Conclusions

The visual appeal of the AXMEDIS Tools has considerably improved in the last year. However, usability is still affected by some inconsistencies, confusing layout, meaningless and abstract icons, some awkward terminology, and a lack of simple instructions provided as on-line help.

Many of the usability problems found are not severe problems because the tools can be used without removing these shortcomings. However, the shortcomings may increase learning effort for potential users, may increase the probability of user errors, and by this reduce the effectiveness and efficiency of use.

The usability inspection identified some barriers to use the tool successfully and efficiently, and made specific recommendations for changes. The implementation of some of these shortcomings may need considerable effort, but it will make a big difference in usability.

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The tools are in use now and results from user tests confirm to some extent the finding from usability inspection.

## **4 Results of informal tests of AXMEDIS Tools (work performed in y3)**

The user partners in the AXMEDIS project (ANSC, ILABS, SEJER, XIM and AFI) have installed and tried out the progressing versions of the AXMEDIS Tools and have continuously fed back comment to the developers in terms of problems they encountered, further requirements detected, their view of usability of the tools. The summary of these comments is provided in the following table.

The AXMEDIS take-up actions partner AX4HOME publishes feedback to the developers of AXMEDIS Tools at their website <http://ax4home.axmedis.org/home/> (Feedback to AXMEDIS; Pending problems).

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Question	ANSC (Aug-2006)	ILABS (Feb-2007, April 2007, May 2007)	SEJER	XIM	XIM (May-2007)	AFI	ACIT
1) did you installed the axmedis editor ?	Yes	Yes	YES	Yes	Yes	Yes	Yes
2) how many installations	4 (one with the database) installer used 2.3 editor used v4.0 28 July updated by Piero and taken from the repository	<p><b>February 2007</b> Currently 3 instances updated to the last AX-Tools version 2.6.7 (2 including the database and 1 without).  The installation coming from Ax-tools does not work as-it-is. There are missing files and the certificates management is not clearly explained. Direct help from partners is needed.</p> <p><b>April 2007</b> The current version of AXEPTool still present side effects during installation that require intervention of our network admin and systems manager to be addressed and not always we have managed in solving them.</p> <p><b>May 2007</b> AXEPTool version 3.2.8 build 6 still present instability in run-time and publishing while reported side effects during installation (that required intervention of our network admin and systems manager to be addressed and not always we have manage in solving them) turned out to be actual requirements not expected on our side as well as the lack of manageability of errors (no log) and disk quota as usually done when dealing with similar services.</p>	2	2, including running on a Mac via MS Virtual PC, which so far has been successful.	Currently 3 plus dedicated server (700Gb+) running Azeptool and local AXDB (apache, tomcat, etc.)	1 updated at last release	Installation of all versions up to AXMEDIS Tools 2.7.4.2 and AXEPTOOL 3.2.23 on PC and Laptop
3) how many objects you have produced ?	About 10 simple samples. More interesting ones on musical instruments. 3 already posted in first version: <a href="http://www.axmedis.org/documenti/vie">http://www.axmedis.org/documenti/vie</a>	<p>Few objects since we could produce “clear” objects, but we encountered problems into protected and licensed objects creation: - when we relied on external services (DSI Object registrator and PMS) we faced sometimes connection problems -&gt; need of direct communication to partners in order to check and eventually restart services and machines, and to understand the reason of the problems and errors - problems in installing services locally, especially PMS (lack of documentation)</p> <p><b>April 2007</b></p>	1, in order to test the HTML Document Viewer	5 (mainly test objects so far, in order to test and learn the tools)	Over 200 so far, but this does not include our automated content production and automated	50	A few simple objects using own content (audio, video, images, text) and several complex objects using the content of example objects.



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	<p><a href="http://w_documenti.php?doc_id=232">w_documenti.php?doc_id=232</a></p> <p>Others coming soon.</p>	<p>The issue of licensing is still pending and this has also an impact on content production especially for those content that are not ours Presently we have produced over 8000 objects as reported in the excel file circulated</p> <p><b>May 2007</b> Initially only few objects since we could produce “clear” objects, but we encountered problems into protected and licensed objects creation: - when we relied on external services (DSI Object registrator and PMS) we faced sometimes connection problems -&gt; need of direct communication to partners in order to check and eventually restart services and machines, and to understand the reason of the problems and errors - problems in installing services locally, especially PMS (lack of documentation) The issue of licensing is still pending and this has also an impact on content production especially for those content that are not ours Presently we have produced over 8000 objects as reported in the excel file circulated we started to publish them all on the AXEPTool, yet due to several occurred chrashes such process has not yet been completed.</p>			publishing which is now underway.		<p>The creation of complex objects was tested using content provided with the AXMEDIS Tools and from the AXMEDIS DB.</p> <p>We have worked through the example for creation of a smil presentation several times and with some modification to learn how to use the SMIL editor.</p>
<b>4) did you used the hierarchy editor and viewer ?</b>	Yes	Yes	YES	yes	yes	yes	Yes. See comments in the latest Usability Inspection report.
<b>5) did you used the visual and behavioral editor and viewer ?</b>	Yes, but it does not work for us (refers to v. 2.3 of the installer)	<p>Yes we tried but it seems that the current status (from Ax-Tools 2.6.7) does not allow a good use: we could not “see” the result of the smil creation from a kind of player but only the tree structure of the smil resource. Since this part is under evolution, we would like to recommend to communicate explicitly which are the new features available at each release.</p> <p><b>April 2007</b> There are still many usability issues especially in relation of tool usage from authors instructional designers that do not have specific programming experience and are used to authoring tools based content development</p> <p><b>May 2007</b> Yes we tried but it seems that the current status thogh improved from Ax-Tools 2.6.7 to 2.7.2 still even though now it is possible to create abd display a simple object (yet not so quicly) HTM and text are not properly supported.</p> <p>There are still usability issues especially in relation of tool usage from</p>	NO	yes	Yes we have had good results with this. It is useful to have SMIL integrated at last even if some features still require external editing.	No	<p>Yes in version 2-6-7 and 2-6-8</p> <p>The SMIL guidelines and example are helpful. However, the guidelines need to be improved and could be shortened without loss of information.</p>

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		authors like instructional designers that do not have specific programming experience and are used to authoring tools based content development this may be a specific problem related to the not so wide-adoption of SMIL					
<b>6) did you used the license editor and viewer ?</b>	Yes.	Yes. We could create and post licenses.	YES but only to test it	yes	Yes, we are creating and posting licenses. It would be useful though to have more guidelines and examples from content owners and collecting societies on typical license models.	No	Yes. See comments in latest version of the usability inspection report.
<b>7) did you used the protection editor and viewer ?</b>	Yes in a very basic way.	Yes.	YES but only to test it	yes	yes	No	Yes
<b>8) did you use the capability of the axmedis editor to call external procedure for processing content ?</b>	Yes primarily on images.	Yes.	NO, where is that?	not yet	Yes this works well	No	Yes, we explored content processing plugins.
<b>9) did you installed the AXMEDIS content</b>	Yes (the rule editor)	Yes.	YES	yes	Yes	Yes	Yes.

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<b>processing tools, AXCP ?</b>							
<b>10) did you used the AXCP editor ?</b>	We used the rule editor but it was to instable (v.1.0). For example if you select F5 (Debug->Go) an error is displayed and the program is terminated	Yes. We have also produced and posted rules for content production. We have provided advices to other partners on how use the tool.	YES	yes	Yes and we have posted sample rules created.	Yes	Yes. See comments in the latest version of the usability inspection report.
<b>11) did you created some java script ?</b>	No. We tried to use the examples but without success.	Yes. They have also been posted.	YES	yes	Yes and we have posted some examples.	We adapted some javascript examples for producing our ojects	Yes, although very difficult with little java script knowledge. Even modification of available java script examples is difficult.  The script language guidelines are helpful.
<b>Have you executed those scripts ?</b>		Yes.			Yes	Yes	Yes, debugged java scripts. Debug functionality is good.  Script execution worked for a simple script.
<b>12) why do not have posted them as examples on the portal ?</b>	--	We have posted the scripts that we use in our scenario.	Because they are incomplete as some functions are still to	we want to create better, more interesting examples -- our tests are			Unable to create a complex and working java script rule.

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			be provided by Ivan (managing files and folders)	really of insufficient quality so far.			
<b>13) did you processed objects on the java script ?</b>	No	Yes.	YES	yes	Yes		Yes, with tools v2-7-4-2
<b>14) did you connected your database to the AXCP grid ?</b>	No: how to do it? It is not intuitive.	Yes.	NO	not yet.	Not yet	Yes	We do not have a DB to connect with AXCP grid.
<b>What are you waiting for installing the focuseek and connecting your database to the axmedis database via Content Processing ??</b>	We are working on it with our technical staff, finding the best solution for our configuration and framework (also relating to the webservice issue) We will give feedback when there will be relevant figures.	We provided fully functional description and implementation of a web-service for accessing Tamino, plus a live accessible installation of our accessible in remote to allow Focuseek to design, develop and test the Tamino interfaces. The same infrastructure has been used to test what developed and results reported have been quite good as previously reported			We are working on focuseek integration.		We do not use an own database which could then be connected to AXMEDIS db.
<b>15) did you protected some obejects ?</b>	No if you refer to the protection viewer. Yes if you refer to DRM.	Yes.	Not yet	not yet.	Yes	No.	Yes
<b>16) did you installed the AXMEDIS database tools ?</b>	Yes – the process was very low level and much time was needed in the manual configuration and tweaking of parameters such as the individual	Yes.	NO	this is still in progress but quite complex. We have tried to install AXDB on Tomcat on the Mac OSX	Yes. Agree with ANSC comments	Yes	Not yet

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	paths. The process was equally long and tricky for the parameters to setup un the editor for query support. Some form of step-by-step, possibly with auto-detection of certain parameters would make the process simpler and faster.			platform rather than a windows server. We do not have a large CMS database at XIM so the AXDB was a lower initial priority for us, but of course we still need to fully test it as part of a complete typical factory setup.			
<b>17) did you loaded some objects ?</b>	Yes	Yes, some samples (if last publication was fine we should have loaded over 8000 objects).	Yes	not yet	Yes	Yes, some samples	Not yet  We only downloaded objects.
<b>18) how many objects did you posted into the database ?</b>	Just some for doing query, upload, download, embed etc. now. We also uploaded some templates to use for the instruments objects: downloading from the database and then adding the new resources	Few samples. If last publication was fine we should have loaded over 8000 objects	0	none yet	Few samples so far (most of our scripts use the file system at present), but will be using the AXDB heavily for the workflow demonstrati on with HP and UR	Few sample	None yet
<b>19) did your</b>	Yes	Yes.	NO	not yet	Yes	No	Only queries to

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produced some queries into the database you installed ?							the AXDB.
20) did you created queries from the java script in AXCP ?	No	Yes we did and we also found and reported a bug into the odbc communication mechanism.	NO	not yet	Not yet	NO	No.
21) what do you think about usability of AXMEDIS Editor ?	<p>Usability is quite good relating to the development level. As already stated, some tools seem too “technical” for an end user. From are testing these sepcific aspects also emerged:</p> <p>The installer is still very basic. More friendly and easy ways of setting up –for example – the params for the query support etc. would be very helpful. Many programs do not run correctly because of missing DLL etc. if installed with the installer</p> <p>(Strongly</p>	<p><b>Feb and April 2007</b> Quite good in the overall. Concerns about: - metadata editor: some hints about fields cardinality (minimum and maximum allowed) should be present, some metadata as the object creator should not be editable (especially it should not be possible to delete it), metadata should be visible from protected objects also - smil editor and player: I’s not usable yet</p> <p><b>May 2007</b> We would like to stress that the adopted user interface still holds some icons that are strongly misleading in our environments (the publishing one); at least this is the feedback we got from our colleagues that have been testing and using the tool</p>	Too technically oriented... Could benefit of "inductive user interface" approach, i.e. from this view what task am I able to accomplish ...	initial impressions were good, familiar GUI, straightforward so far, although we have had some instability issues. This deserves a longer answer and requires more time, but this is the initial impression.	Agree with other comments. Issues with certification – the editor asks for certification when opened, but also claims that it is already certified !  Registration functions should have their own menu rather than be under “help”.	Quite good for producing simple objet. We have not yet tested it for complex objects	See the comments provided in the latest usability inspection report

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	<p>reccomended): Possibility for multiple selection of objects in the hierarchy view... useful, for example to delete, move objects etc. (Suggested): Show some kind of progress/feedback to the user when loading/saving big objects (that take long)</p>						
<p><b>22) which features are missing in the AXMEDIS Editor ?</b></p>	<p>various, but their lack could just be related to the development status (e.g. more intuitive installation setup which we know is being developed)</p>	<p>Stability. Usability for SMIL Player -&gt; Editor also (it's hard to verify our work if it is not possible to see the result). Tooltip on metadata editor green buttons. A reliable installer (the present one misses some files).</p>	<p>Too soon to tell</p>	<p>difficult to say at this stage, but we will compile a feature list</p>	<p>Need better support for objects with large audio or video resources. Also need to have plugin integration into content creation tools, e.g. Photoshop, FinalCut Pro, DreamWeaver so that user can export as file type axm, which could invoke the ax editor</p>	<p><input type="checkbox"/> We have not yet tested all capabilities.</p>	<p>On-line-help for: (1)how to modify the configuration files, (2) how to modify/create java scripts, (3) how to perform realistic task scenarios.  Undo and Redo functions (are not yet implemented in all the tools).  A possibility to customize the tools for different types of users (first time vs. expert users, users who have to perform simple tasks</p>

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					with the resource already added.		only vs. professional users who need the whole functionality, etc)
<b>23) what do you think about usability of AXMEDIS player ?</b>	It is quite usable.	Average. There are still some issue to be solved especially when dealing with SMIL files and there are sometimes (unpredictably) refresh problems and both text and HTM are not adequately supported (hich in our environment is a clear minus). We have explored LASER and for the time being it is out of our interest and target market.	average (for instance, the zoom is too slow in terms of increments)	initial impressions: good but basic (which is to be expected at this stage of evolution)	Average	average	AXMEDIS player is simple compared with the AXMEDIS tools. The interface layout could be made more attractive.
<b>24) which features are missing in the AXMEDIS player ?</b>	At this stage hard to say single features. In general at this stage it looks more like an “explorer/viewer” than a real “player”. But probably better testing could be made once the behaviour editor has been implemented and behaviour can be put in the objects to make them more “interactive”  UPDATE: - opening audio and vido files which are linked	The installation coming from Ax-tools does not work as-it-is since there are missing files and the certificates management is not clearly explained -> need of direct help from partners. Need also to not show all resources. For example, if an html contains an image, now with “next” the user sees the page with the image and then the image alone.  <b>April 2007</b> The installers are too big and tend to scare the end user, they require a long time to be downloaded via HTTP (we could not manage to use the P2P) while probably all would be far easier if a FTP access would be available  <b>May 2007</b> The installers are too big and tend to scare the end user, they require a long time to be downloaded via HTTP, initially we could not manage to use the P2P, once makin issues have been solved the download via P2P worked and proved to be rather efficient; yet we still believe that a FTP access would be highly appreciated if it was available	Too soon to tell as some features are not implemented yet (annotation , bookmarking, going to a specific time index, etc.)	difficult to say at this stage, but we will compile a feature list	See 22 above regarding problems handling large resources: perhaps some streaming is necessary for end-users? Also certificate issues same problem as editor. Also a right click on resources should allow ‘edit in...’ option to pass the	We have not yet tested all capabilities .	The size of the Players installation file is much too big.



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	<p>in an HTML page directly in player</p> <p>- decide in the object the initial size of the player</p> <p>- autofit of images</p>				resource to photoshop/dreamweaver etc as appropriate to the MIME type.		
<b>25) what do you think about usability of AXMEDIS database ?</b>	It is very low-level	So far so good.	N/A	can't say yet	Installation process would benefit from a wizard.	Can't say yet	To search the AXMEDIS DB users knowledge about db query is helpful. You need to know the metadata to search for. Users who lack this knowledge may find querying difficult.
<b>26) which features are missing in the AXMEDIS database ?</b>	<p>More friendly GUI, especially for connection and setup</p> <p>Clearer setup guide</p>	<p>Can't say yet, still under evaluation.</p> <p><b>May 2007</b></p> <p>We would recommend to take care in ensuring that proper support tools for cross consistency between DB data and actual file system structure could be provided especially when considering that P2P storage could insist in the same file system where axmedis objects are stored, as the DB only holds references to them a severe crash of the file system may pose serious problems of data integrity (like the one we have experienced in the early phase of P2P testing)</p>	N/A	can't say yet, we will compile a feature list			The query dialog is very technical and not user friendly. The submit button is not visible enough. Even after months I tend to click to the OK button first, and when nothing happens remember to click to SUBMIT.
<b>25) did you installed the</b>	Yes	Yes – quite straight and well explained.	NO	yes	Yes	yes	Yes

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<b>Programme and publication ?</b>							
<b>26) did you installed the workflow ?</b>	Yes	Yes, although this is a complex process.  <b>April 2007</b> Especially for a demo system like ours that ill need also IIS... the co-existence of several such objects can generate configuration issues	NO	yes	Yes	yes	Yes, but failed the first time. Another installation with the help of UR and a tutorial contributed a lot to understanding the complex installation procedure. However, we do not have all the sw needed to set up gateways.
<b>27) did you use the fingerprint for audio, video, and text ?</b>	No. We can't manage to get it working: Note for the editor: the editor gives a message "Unable to find plugin C:\...\audioFPplugin.dll") but the file is actually there	No, these functionalities should be transparent in our opinion.  <b>April 2007</b> The activity has been planned and is under execution. We have found some problems in the usage (including some errors during execution, probably also due to some lack of adequate documentation) Yet in our opinion, these functionalities should be transparent in our opinion. Furthermore we have not foreseen their usage for our content.  AudioFingerprintExtraction --> on a 417 KB wav file:  Debug Assertion Failed!  Program: ...axeditor.exe File dbgdel.cpp Line: 52  Expression: _BLOCK_TYPE_IS_VALID(pHead->nBlockUse)  TextFingerprint --> ok, generates the ash in string format(in our case sample: P'z !(LDÓ _8ß) but then we do not know how to use it	Not yet	not yet	Not yet	No	Yes. See comments in latest usability inspection report.
<b>28) did you used the</b>	Yes if you refer to content	Yes for images (worked) and audio (see previous comments).	Not yet	not yet	Yes if you refer to	Yes, only for test	Yes. See comments in

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adaptation algorithm for audio, video, etc.. ?	processing				content processing		latest usability inspection report.
29) did you used the descriptors for audio video, and text ??	Yes	<p>No also in this case functionalities should be transparent in our opinion.</p> <p><b>April 2007</b> The activity has been planned and is under execution. We have found some problems in the usage (including some errors during execution, probably also due to some lack of adequate documentation) Yet in our opinion,also in this case, such functionalities should be transparent in our opinion. Furthermore we have not foreseen their usage for our content.</p> <p>TextDescriptors: KW from Semantic Analysis / Comparison, both give: Error -&gt;Unknown exception</p>	Not yet	not yet	Not yet	No	Yes. See comments in latest usability inspection report.
30) which algorithms are missing ?	--	<p><b>April 2007</b> Can't say yet. The question is too open as it could both refer to adaptation, and processing as well as to fingerprinting and descriptors extraction, or even to protection.</p> <p>In our opinion what is certainly missing is fingerprinting and watermarking for images.</p> <p><b>May 2007</b> Can't say yet. The question is too open as it could both refer to adaptation, and processing as well as to fingerprinting and descriptors extraction, or even to protection.</p>	Too soon to tell	can't say yet, we will compile a list of desirable algorithms.	We have not yet found any missing processing algorithms, but would like to have a 'get file size' file system function added to the script language.		--
31) which features are missing the tools ?	In general friendly (tutorial based) help system, wizards and templates for setup and object creation	<p>Installation procedure should be provided with adequate documentation. The shortcut menu available from start is too long, a kind of separate group for docs should be created instead of keeping those link mixed up with the tools ones. SMIL support. Maybe a few information about the protection algorithms (just a few rows). Visibility of metadata fro protected objects. A mechanism of selection of which resources have to be visible, and which ones are only "auxiliary".</p> <p><b>April 2007</b> Please see also previous commenst related to installing procedures installer's</p>	Too soon to tell	initial impressions: the installation procedure needs to be improved. MS runtime DLLs were missing from	Please refer to previous comments, and the above comments regarding integration with content	Installation phase is too complex. We also agree with ILABS.	<p>Non technical persons will need more detailed descriptions of how to install workflow and configure tools.</p> <p>On-line-help for:</p>

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		<p>file dimentoins and download methods</p> <p>Furthermore there are still usability issues for content authoring personnel with no programming experience but used to work with authoring tools</p> <p><b>May 2007</b>          Installation procedure should be provided with adequate documentation. The shortcut menu available from start is too long, a kind of separate group for docs should be created instead of keeping those link mixed up with the tools ones. SMIL support. Maybe a few information about the protection algorithms (just a few rows). Visibility of metadata fro protected objects. A mechanism of selection of which resources have to be visible, and which ones are only “auxiliary”.</p> <p>Please see also previous commenst related to installing procedures installer’s file dimentoins and download methods</p> <p>Furthermore there are still usability issues for content authoring personnel with no programming experience but used to work with authoring tools</p>	<p>some tools but not others, so we had manually search and copy these to get things working (eg MSVCP71.D LL missing from PaP rule editor but present in axmedis editor, while other MS dlls were present in rule editor but missing in axmedis editor). This would not have been a problem on a development machine with visual c++ present, but we were testing on content production machines.</p>	<p>creation tools.</p>	<p>(1)how to modify the configuration files, (2) how to modify/create java scripts, (3) how to perform realistic task scenarios.</p> <p>Undo and Redo functions (are not yet implemented in all the tools).</p> <p>A possibility to customize the tools for different types of users (first time vs. expert users, users who have to perform simple tasks only vs. professional users who need the whole functionality, etc)</p>
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## 5 User Validation of AXMEDIS Tools (work performed in y3)

### 5.1 Introduction

This chapter reports about the user testing of the AXMEDIS Tools.

Throughout the development of AXMEDIS tools appropriate user-centred activities have been embedded into the development process. In the second year the focus of user-centred activities was on usability inspection and informal user testing to show that the tools are usable. On the basis of the reported bugs, comments for improvements and other user feedback gathered from these activities the AXMEDIS Tools have been improved considerably and have reached a sufficient degree of maturity to allow formal, conclusive testing with potential users under realistic conditions. Towards the end of the third year the focus therefore shifted to formal user testing to show that the tools are useful for prospective users and to demonstrate a positive cost/benefit for the users and owners of the tools, i.e. companies and organizations which will use the tools.

The AXMEDIS Tools are complex and even the user partners involved in AXMEDIS do not use all functionality. Some user partners focus on content production tools, others are more interested in content distribution tools. Only some partners use the AXMEDIS tools including workflow management tools. The amount of training for learning to use AXMEDIS Tools is estimated to be at least 7-10 days to understand the tools and no less than a month before you can do something serious with the tools. The focus on usage of specific parts of the AXMEDIS tools and time constraints led to the decision to foresee separate user tests for:

- AXMEDIS Content Production Tools (AXMEDIS Editor, Content Processing Rule Editor)
- AXMEDIS Content Distribution Tools (AXMEDIS Programme and Publication Editor, Engine and Monitor)
- AXMEDIS Workflow Management Tools

The content, AXMEDIS objects and rules, used for the tests, the test methods, and the test procedure are similar for the four user tests and described in the next chapters for all tests together. The user sample and task scenarios are different for each of the user tests and are described together with the test results in dedicated sections.

The last section concludes by attempting to synthesize the results of the tests in order to understand the overall quality of use of the AXMEDIS Tools and its strengths and weaknesses.

Appendices include the material and questionnaires used during the tests.

### 5.2 Objectives of the user validation

The main objectives of user validation are derived from the overall objective of the AXMEDIS project to reduce the cost of cross-media publishing stated as “reduction of costs in the order of 30% in the automatic production of content and for on-demand production” in the technical annex. The following aspects will be considered in the validation process:

- (1) Assessment of the costs and benefits of AXMEDIS Tools for individual users
  - a. Workflow efficiency
    - i. estimation of workflow efficiency through use of WFM
    - ii. estimation of speed up of repetitive tasks by (re)using rules
  - b. Added value compared to the current way of working
  - c. Satisfaction of users with AXMEDIS Tools
  - d. User acceptance of cross-media publishing with AXMEDIS Tools
  - e. Costs: Estimation of the effort required to learn using AXMEDIS Tools & WF

- (2) Assessment of the potential business benefit of the AXMEDIS Tools
  - a. Workflow efficiency
  - b. Cost/benefit for the organisation

The extent to which the icons for the AXMEDIS Tools on the desktop are understandable for the users was stressed as an additional important usability issue. Therefore a test has been designed where about 20 users were required to rate the ease of understanding and usefulness of the icons.

The user tests are in progress and the following chapters report the results which are available by the end of September.

### 5.3 Summary of the AXMEDIS Tools features and focus of the tests

#### (1) AXMEDIS Content Production Tools

The test of AXMEDIS Content Production Tools focused on the user visible parts and functionality of AXMEDIS Editor, AXMEDIS Player and on some functionality of the AXMEDIS Content Processing Rule Editor.

The **AXMEDIS Editor** is used to create AXMEDIS Objects embedding "raw" digital resources (images, video, documents, etc) or other AXMEDIS Objects from file or from database. The AXMEDIS Object structure can be modified with the editor. Content Processing Plug-ins are provided to manipulate the resources. The editor can be used to search the AXMEDIS Database for content, to retrieve and to store content. Also included are editors and viewers to view the resources and for visual and behaviour presentation, to associate metadata with objects, to define DRM and to protect objects.

The **AXMEDIS Player** provides functionality to play AXMEDIS objects, to view the resources inside an object, the metadata of the object, the SMIL presentation, and the AXMEDIS structure.

The **AXMEDIS Processing Rule Editor** manages content processing rule files and provides functionality for the editing and building of rules, and for the debugging, testing and validating of script code associated with a rule. In the user tests users did not have to create new rules, but instead had to use existing rules.

#### (2) AXMEDIS Content Distribution Tools

The test of AXMEDIS Content Distribution Tools focused on the user visible parts and functionality of AXMEDIS Programme & Publication Editor and on some functionality of the AXMEDIS Programme & Publication Engine and Monitor to test, activate and monitor programmes.

The **AXMEDIS Programme & Publication Editor** provides functionality to create and edit programme and publication programmes, query support to the AXMEDIS database, to select, to schedule, and to return with a list of relevant objects. Programme rules can be tested and activated through the **AXMEDIS Programme & Publication Engine** and monitored through the **AXMEDIS Programme & Publication Monitor**.

#### (3) AXMEDIS Workflow Management Tools

The focus of the usability evaluation of the AXMEDIS Workflow Management Tools was on the user visible parts and functionality of the tools, i.e. the user interfaces. The test of the WF tools focused on the evaluation of (1.1) WF creation interfaces (Openflow, Biztalk) and (1.2) User WF interfaces (Workflow Viewer of AXMEDIS Editor and AXMEDIS Content Processing Rule Editor).

**AXMEDIS Workflow and Workflow manager – Openflow** can assign tasks and activities to single users or workgroups and also to automatic applications, can trace the complete history of a certain situation e.g. participants involved, activities and actions executed and invoked. It is possible to carry out performance and efficiency analysis and verify the correct implementation of the adopted model. OpenFlow is strongly web-oriented and offers complete support for developing and executing workflows via a browser. The interaction with OpenFlow uses simple HTTP requests as in, for example, process modelling, assignment of users to activities, definition of the interaction with the applications. Every user receives his task which interacts with appropriate applications through the network

#### **AXMEDIS Workflow and Workflow manager – Microsoft Biztalk**

The main functionalities are to develop, deploy, and manage integrated business processes and XML-based Web services. The Microsoft Biztalk Server communicates to AXMEDIS Tools using Workflow Plug-ins directly without the need of Workflow Gateways.

With regard to the connection to AXMEDIS Tools, the functionality of Openflow WfMS and Microsoft Biztalk provide the same functionality.

The AXMEDIS Editor and AXMEDIS Content Processing Rule Editor can be launched from the workflow engine and interact with it. A user of the AXMEDIS editors can see the status of the object in the Workflow process viewer, assign to a task, and notify the completion of a task and proceed to the next step in the production process.

## **5.4 User sample**

AXMEDIS is meant to be used by professionals in the cross-media publishing domain. Students as test persons are not fully acceptable from a methodological point of view. The aim was to put the emphasis on the representatives of the future user population of the AXMEDIS Tools, i.e. employees from the user partners who are not involved in the AXMEDIS project themselves.

The recruitment of a sufficient number of test users who are not involved in the AXMEDIS project turned out difficult due to language problems (test users must be familiar with the English language because the AXMEDIS Tools use the English language) and due to the learning effort the test users would have to undergo. The amount of training for learning to use AXMEDIS Tools is estimated to be at least 7-10 days to understand the tools and no less than a month before you can do serious work with the tools. Training of new users was therefore considered time consuming for the user partners who would have to provide training and for the test persons. Anticipating this risk that some test users who are not involved in AXMEDIS may drop out the decision was made to attract additional users from the AXMEDIS project for the test the only constraint being that users who had been involved in the development of the AXMEDIS Tools were excluded.

The final user sample consists of the following groups of users:

- **Experienced users of AXMEDIS Tools.** These are individuals from the user partners, involved in AXMEDIS, who have been working with the AXMEDIS Tools for some time and who have used mainly:
  - Content Production Tools. These users have created a large amount of AXMEDIS objects and have been involved in demonstrations of the AXMEDIS content production tools (AXMEDIS editor, AXMEDIS content production rule editor). Users of this group are so far 6 from ILABS and 1 from AX4HOME (more users are expected to come from ANSC, SEJER and XIM).
  - Content Distribution Tools. These users have worked with the distribution tools and have been involved in demonstrations of the AXMEDIS content distribution tools (AXMEDIS programme and publication editor, AXMEDIS P&P engine, AXMEDIS P&P monitor). Users of this group are so far 1 from EUTELSAT (more users are expected to come from TISCALI).

- Workflow Tools. These users have mainly focussed their work on using content production tools including workflow tools and have been involved in demonstrations of the Workflow tools. Users of this group are 5 from ILABS (more users are expected to come from XIM and possibly ANSC who is struggling with setting up workflow environment).
- **Beginners.** Employees from the AXMEDIS user companies who are not involved in AXMEDIS. These users can be considered cross-media publishing domain experts, however, they are beginners with respect to the AXMEDIS Tools. These users were trained in using some components of the AXMEDIS Tools:
  - Content Production Tools. Users of this group are so far 1 from ILABS (more users are expected to come from ANSC, SEJER and XIM).
  - Content Distribution Tools. Users of this group are so far 5 from EUTELSAT and 1 from ELTEO (more users are expected to come from TISCALI).
  - AXMEDIS Workflow Tools. Users of this group are so far 2 from ILABS (more users are expected to come from XIM, and possibly ANSC).

In order to produce a minimal basis for simple statistical analysis, 15 test users per group according to the above-mentioned profiles are needed.

For the test of Workflow Management Tools, a use model (Table 1) was created which described the types of users to be involved in the test and the identified key tasks for each group of users.

<b>Roles</b>	Administrator of the Workflow (WF) Tools	Project Manager	End Workers (Clerical Actors) i.e. Editors, Technicians, Designers, Graphic people, Maintenance people, Marketing and sales people
<b>Key tasks</b>	Install WF Tools Maintain WF Tools, i.e. install updates	Define WF Approve operations Solve problems Make (final) decisions	Receive task from WF manager Complete task Notify task completion
<b>WF Interfaces</b>	Zope, Openflow, Biztalk	WF Interface of Zope, Openflow, Biztalk	WF Interfaces of the AXMEDIS Tools (e.g Workflow Viewer in AXMEDIS Editor)

**Figure 88: Use model for the test of the AXMEDIS Workflow Management Tools**

## 5.5 Test procedure

User tests have the aim to find out whether the AXMEDIS Tools are useful, and whether they offer benefits to the users and to the organisation who owns them. These are two entirely different things. User validation does neither examine nor evaluate the users, and is not an assessment of developers or user partners, but an assessment of the usefulness of the AXMEDIS Tools and WFM for specific tasks. The objective of this effort is to provide a diagnosis which enables improvements of the AXMEDIS Tools and WFM Tools.

Valid and meaningful tests were planned which focus on specific components of the tools:

- **Content Production:** AXMEDIS Editor, AXMEDIS Content Production Rule Editor and Scheduler
- **Content Distribution:** AXMEDIS Programme and Publication Editor, Engine and Monitor,
- **Workflow:** Workflow Management Tools



The following section describes how user tests were executed.

### 5.5.1 Task scenarios and content

The user tests were arranged along task scenarios, consisting of typical tasks and task sequences, which users have to work through. This is to ensure that users keep their context of use and a typical workflow in mind, which is important in order to detect usability problems and whether the tools are suitable for the tasks. The tasks were chosen in a way to ensure that the user inspects a relevant set of the functionality. The task scenarios are included in the appendix. The test of the AXMEDIS Workflow Tools was conducted under conditions which are representative for the future application context: a kiosk demonstration.

As a by-product of informal testing the user partners have created a large number of AXMEDIS objects and rules which are archived in the AXMEDIS database and contribute now to a realistic usability testing.

### 5.5.2 Measures and methods

To meet the objectives of the user validation (described in chapter 5.2), objective and subjective measures have been selected according to the definition of the success criteria.

Objective measures:

- Satisfaction of users with AXMEDIS Tools: measured with the SUMI questionnaire
- Number of errors detected in the tools. List of errors detected.

Subjective measures:

- Added value compared to the current way of working: measured with targeted questionnaire
- Workflow efficiency: measured with targeted questionnaire
- Estimation of workflow efficiency through use of WFM: measured with targeted questionnaire
- User acceptance of cross-media publishing with AXMEDIS Tools: measured with targeted questionnaire
- Benefits and added value of AXMEDIS Tools for users: measured with targeted questionnaire
- Costs: Estimation of the effort required to learn using AXMEDIS Tools & WF (measured by asking user partners to estimate the effort)
- The extent to which the icons for the AXMEDIS Tools on the desktop are understandable for the users: A test was designed where about 20 users were required to recall and recognize icons, and to rate the ease of understanding and usefulness of the icons.

Speed up of repetitive tasks by (re)using rule, workflow efficiency for the organisation, and cost / benefit of the AXMEDIS Tools for the organisation who owns the tools are not yet measured in the tests because there is no user partner in the project who can at this stage in the project provide data about these success factors.

### 5.5.3 General overview of the test procedure

**Learning phase.** Users not familiar with the AXMEDIS Tools had to learn using the tools and were given at least one week time to make themselves familiar with the tools.

A typical test session lasted 1 to 1:30 hours and included the following steps.

**Brief introduction (5 minutes).** The test session began with a brief introduction to the AXMEDIS project and the purpose of the test (Appendices 1 and 2).

**Completion of the User Profile questionnaire (2 minutes).** Then the test person completed the user profile questionnaire which collects information about socio-demographic data, about expertise in content

production, distribution, and cross-media publishing, about the usage of tools and services the test person currently uses for work, and about tools competing with AXMEDIS tools (Appendix 3).

**Completion of the Questionnaire about the installation, registration and certification of AXMEDIS Tools (3 minutes)** (Appendix 4).

**Perform task scenario (45 -60 minutes).** The user worked through the task scenario from task 1 to task n. The first task was a rather simple task to help the user familiarize with the tool and with the test situation (Appendix 5).

**Completion of the Targeted questionnaire (10 minutes).** Having completed the task scenario the user was asked to complete a targeted questionnaire (Appendix 6).

**Completion of the SUMI questionnaire (10 minutes).** The SUMI questionnaire is not included in the appendix. ACIT has a license to use this questionnaire and has agreed not to reproduce or re-publish the questionnaire.

**Completion of the icon analysis questionnaire (10-15 minutes)** (Appendix 7).

**Thank the user** for the willingness to participate.

## **5.6 Data collection and analysis**

The user tests were carried out by the user partners and the data from test users were sent to ACIT for data analysis.

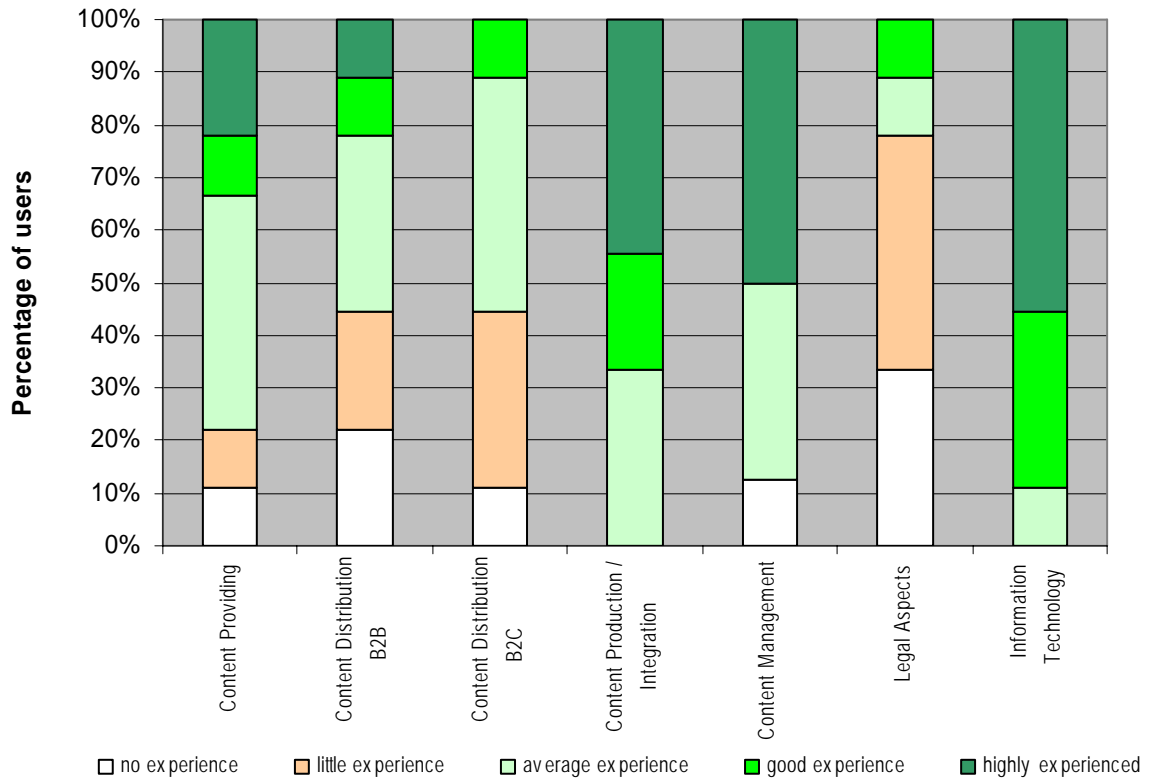
In order to produce a minimal basis for simple statistical analysis about 15 test users are needed per user group. For SUMI analysis a minimum of 6 test users per group is the minimum.

## **5.7 Results**

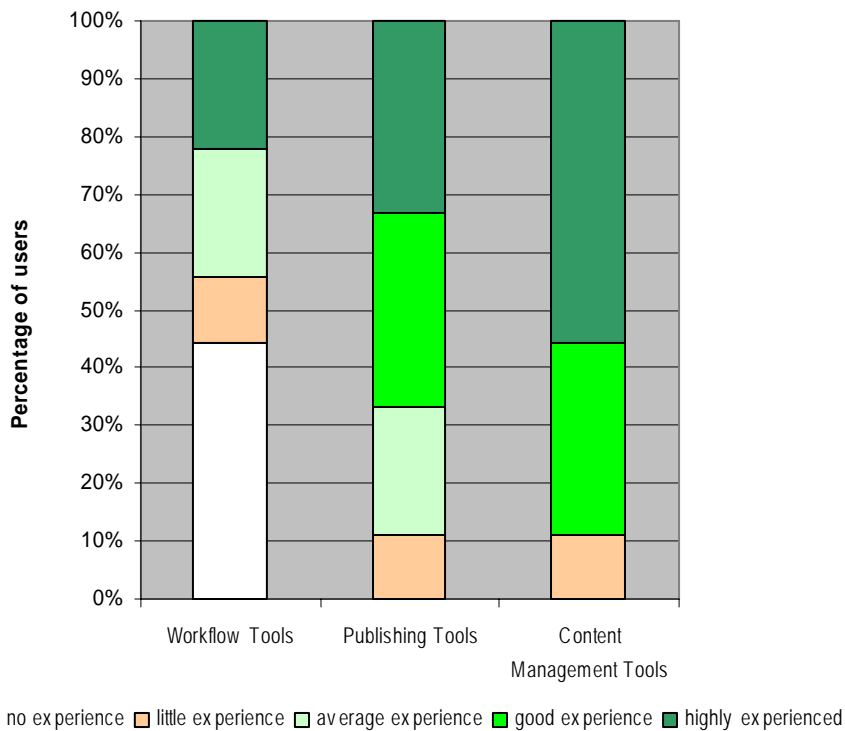
### **5.7.1 Results - AXMEDIS Content Production Tools**

#### **User sample**

Nine users participated in the test. Overall, the user sample matches the target group of content production tools. The users rate their personal experience in content production and integration and their experience with content management tools from average to highly experienced (Figures 88 and 89).

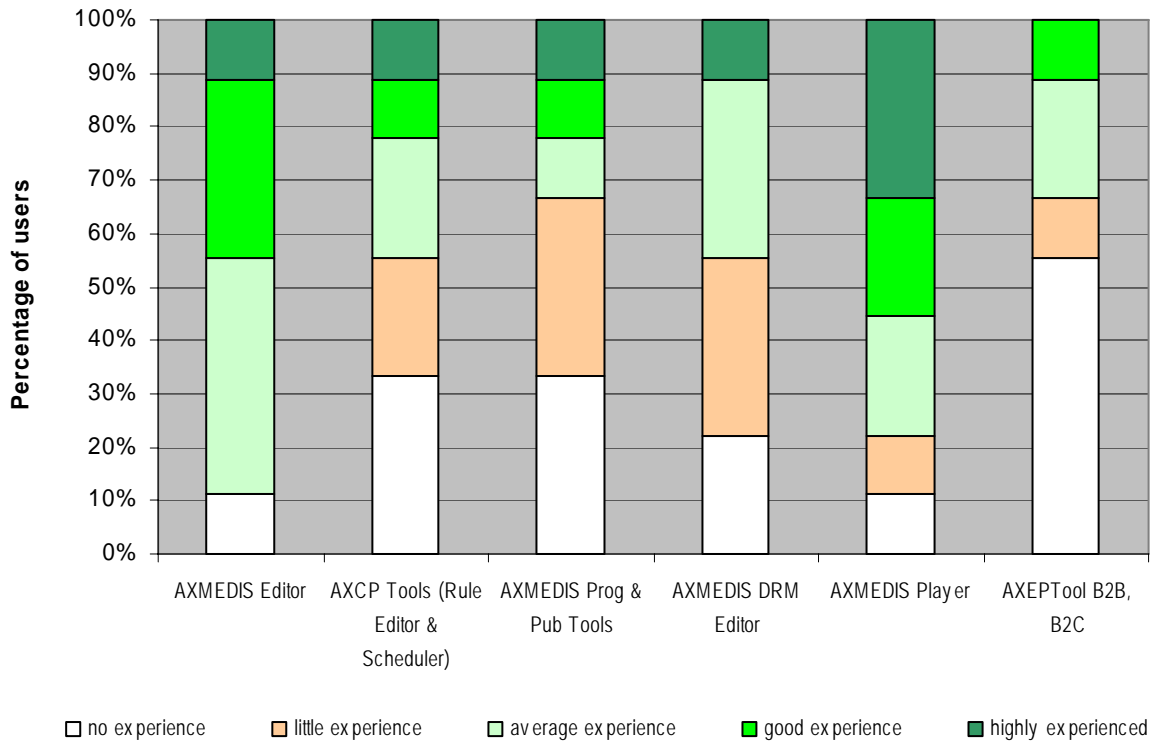


**Figure 89: Personal experience of users in cross-media publishing, 9 users**

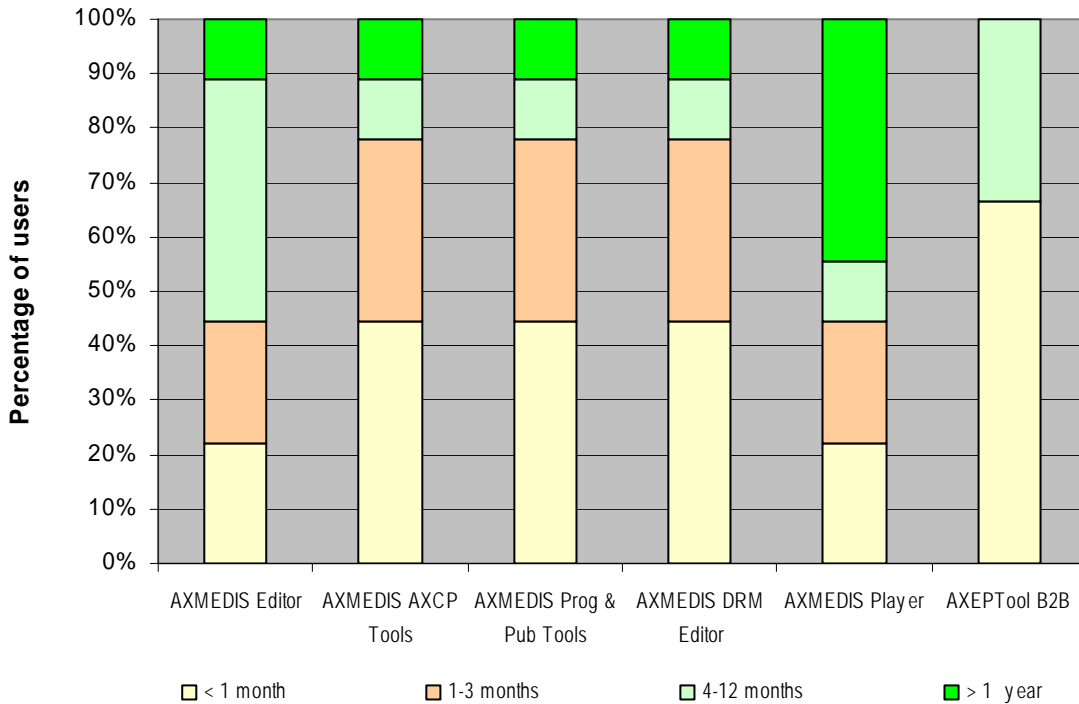


**Figure 90: Personal Experience in tool use (other than AXMEDIS Tools), 9 users**

Most of the users rate their experience with the AXMEDIS Editor from average to highly experienced (Figure 90). Half of the users have been using the AXMEDIS Editor for 4-12 months (Figure 91).

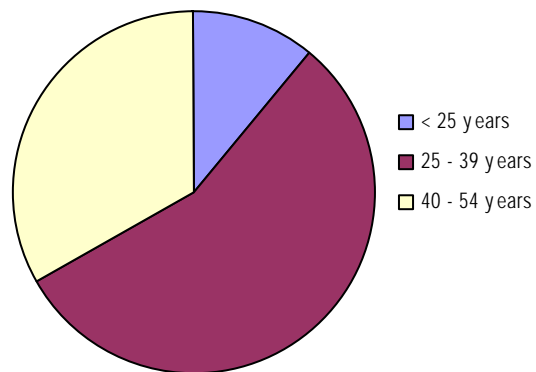


**Figure 91: Personal experience in the use of AXMEDIS Tools, 9 users**



**Figure 92: How long users have been using AXMEDIS Tools, 9 users**

The age of users varies in the range from < 25 years to 54 years (Figure 88). The gender distribution of the user sample is not balanced (2 female, 7 male users).



**Figure 93: Age distribution of the sample, 9 users, Content Production Tools**

### **Assessment of the installation, registration and certification of AXMEDIS Tools**

All users have done a full installation of the AXMEDIS Tools themselves. Two users found the installation very easy, six users found the installation easy.

Two users considered configuring of the tools more complex than expected because “you have to know some details of the services”.

The registration of tools was considered easy by seven users. Only one user found registration difficult. Nevertheless, three users reported that “registration did not work out so easily and it was necessary to repeat it many times”, that they were “unable to register for about a week - probably since the server was down”, and “sometimes the registration fails (“server error, please try again later”); another problem is that it is not possible to choose the password, and the provided one is difficult/impossible to remember”.

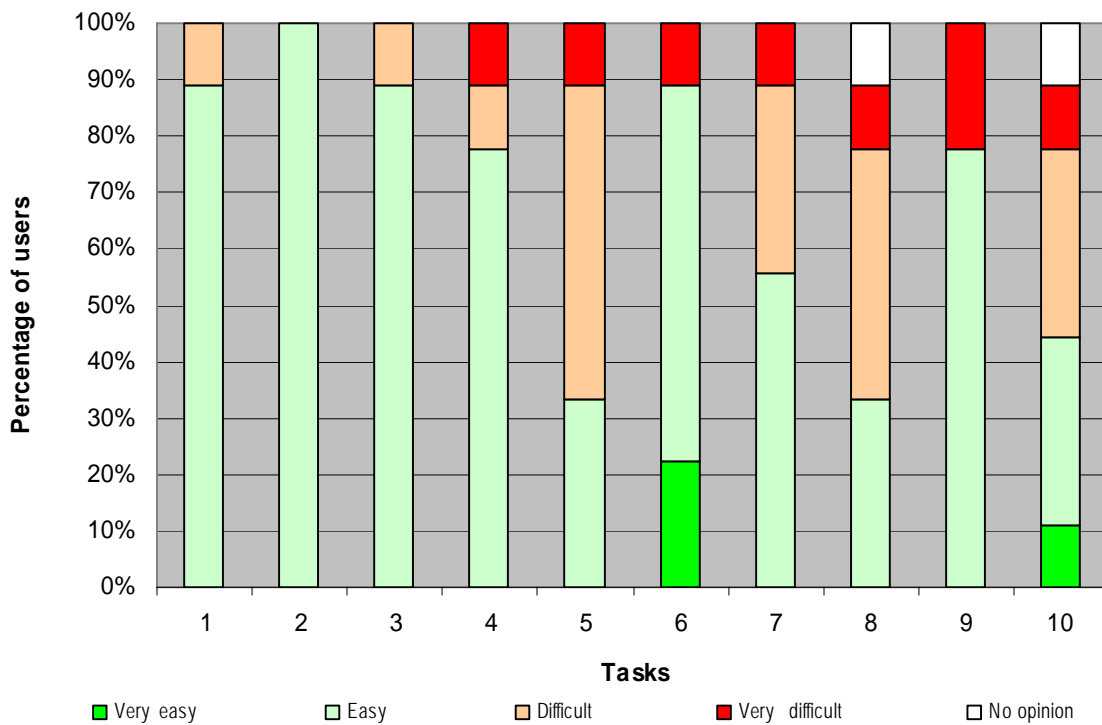
The certification of tools was considered easy by seven users. Only one user found certification difficult. Nevertheless, three users reported that “certification did not work out so easily and it was necessary to repeat it many times”, “got some errors, probably since the server was down”, and “certification doesn't work from behind a corporate firewall; even from the open Internet, sometimes the certification fails (“bad connection with PMS server”)”.

### **Assessment of the AXMEDIS Content Production Tools**

**How easy (or difficult) did users find the tasks?** For the majority of users the ten tasks in the task scenario were considered easy:

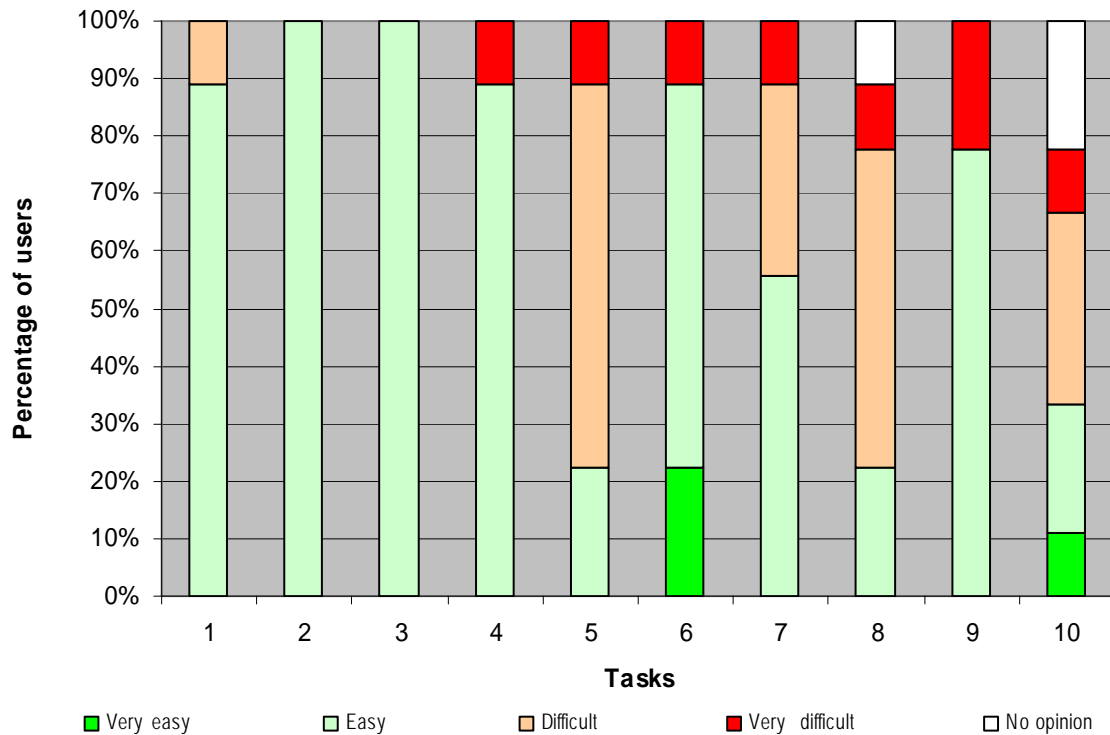
- Task 1: Familiarize with the AXMEDIS Editor
- Task 2: Create a new AXMEDIS Object
- Task 3: Modify an AXMEDIS Objects
- Task 4: Edit Metadata of an AXMEDIS Object
- Task 5: Add DRM to an AXMEDIS Object
- Task 6: Play AXMEDIS objects with the AXMEDIS Player
- Task 7: Use content processing plug-ins
- Task 8: Explore a SMIL file
- Task 9: Protect an AXMEDIS object
- Task 10: Automated content production

More than half of the users found it difficult to “add DRM to AXMEDIS object” (task 5) and to “explore a SMIL file” (task 8). About half of the users found the tasks “use content processing plug-ins” (task 7) and “automated content production” (task 10) difficult.



**Figure 94: How easy (or difficult) did users find the tasks, 9 users**

**How easy (or difficult) was it to use the AXMEDIS Content Production Tools for the completion of the tasks?** All subjects were able to solve the tasks in the task scenario with the AXMEDIS Content Production Tools. Using AXMEDIS Content Production Tools for the completion of tasks was considered easy or very easy for the majority of users. Seven users found the DRM editor/viewer (in task 5) difficult or very difficult to use. Six users found the SMIL editor/viewer difficult or very difficult to use (in task 8). Four users each found the content processing plug-ins (in task 7) and the content processing rule editor (in task 10) difficult or very difficult to use.



**Figure 95: How easy (or difficult) did user find to use the AXMEDIS Content Production Tools for the completion of the tasks, 9 users**

For one of the test users the experimenter observed and noted down what the user was doing. Here is the report.

**Task 1: Become familiar with the AXMEDIS Editor**

The user opened the DRM editor because the icon is much more "evident". The fact of many 'editor' labels is confusing. Also to have so many tools in the same start menu with a mixture of programs, documentation, similar names and icons was very confusing

**Task 2: Create a new AXMEDIS Object**

The user looked for the "embed resource" function in the File menu. The icon results are totally unclear.

**Task 3: Modify an AXMEDIS Objects**

The logical operators (CONTAINS, etc) in the Query Support window are very unclear as there is no hint for understanding that EQ is equal to etc. It was not possible to create a more complicated query (AND (OR OR OR) as requested in the task. No scrolling for SMIL text!!! The user noticed that it is not possible to query the resource type (e.g. SMIL).

**Task 4: Edit Metadata of an AXMEDIS Object**

The creator name is not present by default. The user was confused on how to change the metadata: he would have expected to have a button with something like "change/edit", or double-clicking on the element, or just clicking (like when you rename a file in Windows Explorer). Delete the object creator URL was not possible, there was "no URL to delete!!" The user was asking "where is the "OK" "do it" button for updating the metadata element content?"

**Task 5: Add DRM to an AXMEDIS Object**

When “create new grant” is pressed it is not clear what happens. The user is a bit confused that there is not an "OK"/"confirm" after having added a grant with conditions. The object with the grants was saved to disk, opened again but none of the conditions were saved. Doing it a second time, 10 times are "lost".

**Task 6: Use content processing plug-ins**

The user noticed that the plug-in interface is very unusable, especially the following problems/issues were raised:

- all the plug ins are shown, no menus, very difficult to find the right plug in
- the plug ins are not in alphabetical order
- the input resource is asked again even if right clicking on it
- the resource name is cut and often unreadable in the dropdown
- in an image processing plug in it is nonsense to show audio video etc resources
- no clue what an INT32 is
- no hint is given for what the parameters do
- scale plug-in asks for height and width but it should ask a scale factor
- the scaling didn't work
- there is no preview for the plug-ins (for example in the blur what is the sigma??) would be better to have - some sliders for some parameters so as to experiment
- "What is a mimetype?" for conversion. The user would expect some kind of dropdown for choosing the conversion type. The user tries to write "GIF" and the output is "Unknown exception". No clue what this means!!!

It is not possible to cut or down sample the mp3: only audio fingerprint extraction is proposed for mp3.

No resize for the video to be found.

The mp4ToAvi plug-in on an mp4 creating new resource crashes the editor.

**Task 7: Play AXMEDIS objects with the AXMEDIS Player**

No comments.

**Task 8: Explore a SMIL file**

The visual editor is absolutely incomprehensible.

**Task 9: Protect an AXMEDIS object**

The user has no clue what to put in the blowfish parameters (int16 etc.). He got an axcs error when requesting the final axoid (it was not possible to protect). The user would like a wizard for protection.

The user ran out of time. The test ended without completing task 10.

**Users' satisfaction with the time the system takes to respond.** Six of the users are satisfied or very satisfied with the response time of the system. Two users are less satisfied. Another user does not have an opinion about this issue.

**Users' opinion about the way the system asks for user input.** Seven users like the way the system asks for user input. Two users do not like some aspects: eg. “no information on some specific parameters, e.g. what is the difference between PAR and Internal PAR? What is the default value of "key length" in the Blowfish algorithm?”, “Too complicated”.

**Users' opinion about the way the system provides feedback about the status of work.** Eight users consider the status of work provided by the system sufficient. One user is missing more system feedback: “Sometimes I was told I couldn't do something but didn't know what or why”.



**Functions other than those provided in the AXMEDIS Tools that could have helped users complete a task easier and/or quicker.** Three users are convinced that additional functions could have helped completing a task easier and/or quicker:

- “possibility of editing resources like txt and html from Editor”
- “a Text Editor would be helpful”
- “a configuration editor/wizard to modify the default tool configuration”.

### **Usefulness of the AXMEDIS Query Support**

Four users each found search for AXMEDIS Objects using defined Dublin core / AXInfo metadata very useful and useful. For one user the query support does not make a difference. Another user found it distracting: “It's a duplicate effort”. One user found search for AXMEDIS Objects according to available rights/certified software very useful, another two users found this search useful. For one user this type of search does not make a difference. Four users do not have an opinion about this issue (“Never tried.” “Not used.” “If no right is granted to me, it's better to know in advance...”). All users were able to find AXMEDIS Objects in the database in reasonable time.

### **Further issues**

**Usefulness of the AXMEDIS Object concept.** Two users find the AXMEDIS Object concept very useful, four find it useful. For two users the concept is of limited use and another user does not have an opinion about the concept. One user said he is not sure really what it is “useful for”.

**Usefulness of the AXMEDIS Content Production Tools in helping users doing their work.** Four users finds the tools very useful or useful, four users find the tools are of limited use, and one user do not find the tools useful.

Figure 96 illustrates which features of the AXMEDIS Editor users find useful and Figure 97 shows which of these features they find easy (or difficult) to use. The features which most users found difficult to use are the DRM Editor, Visual (SMIL) Editor.

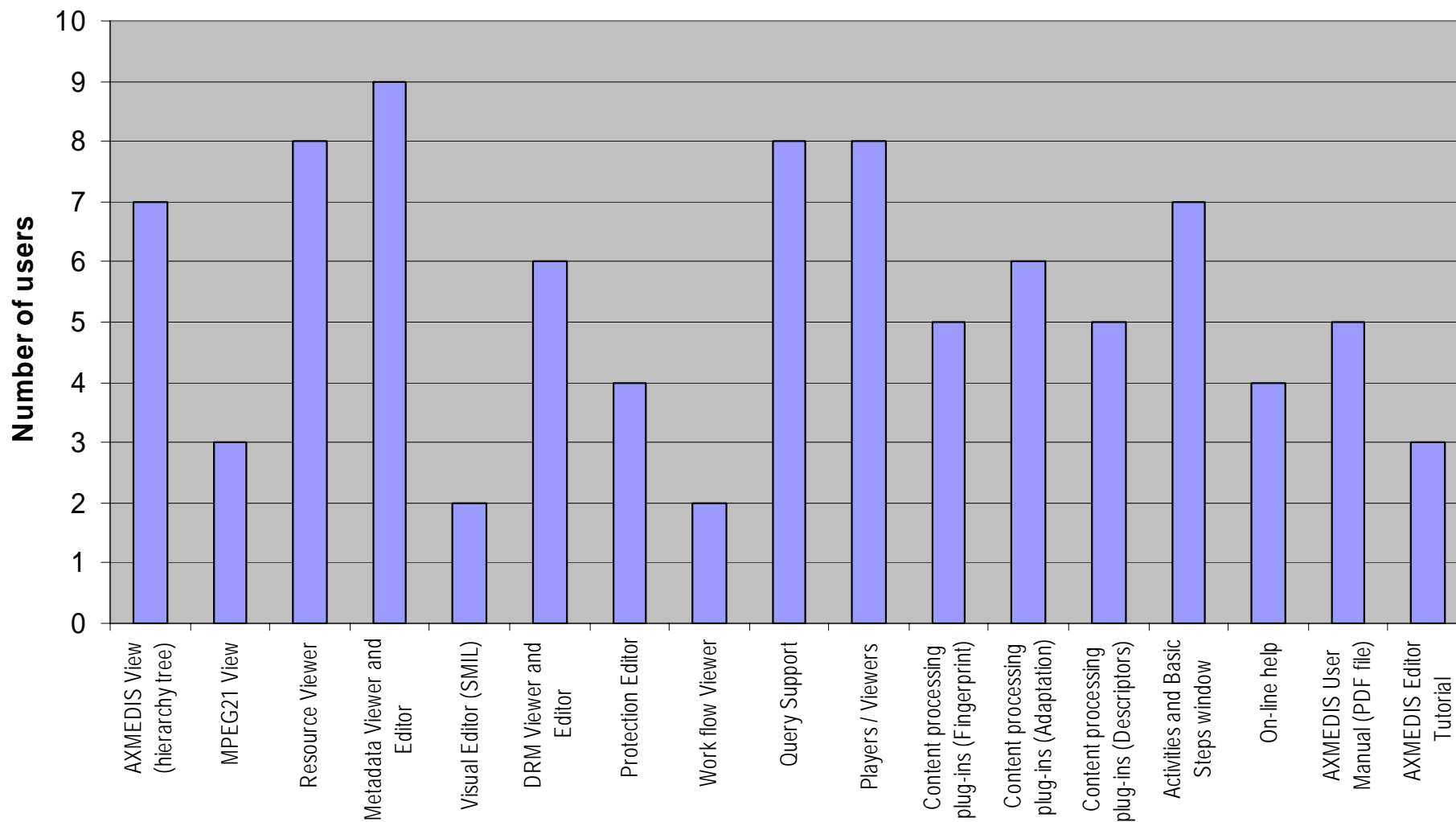
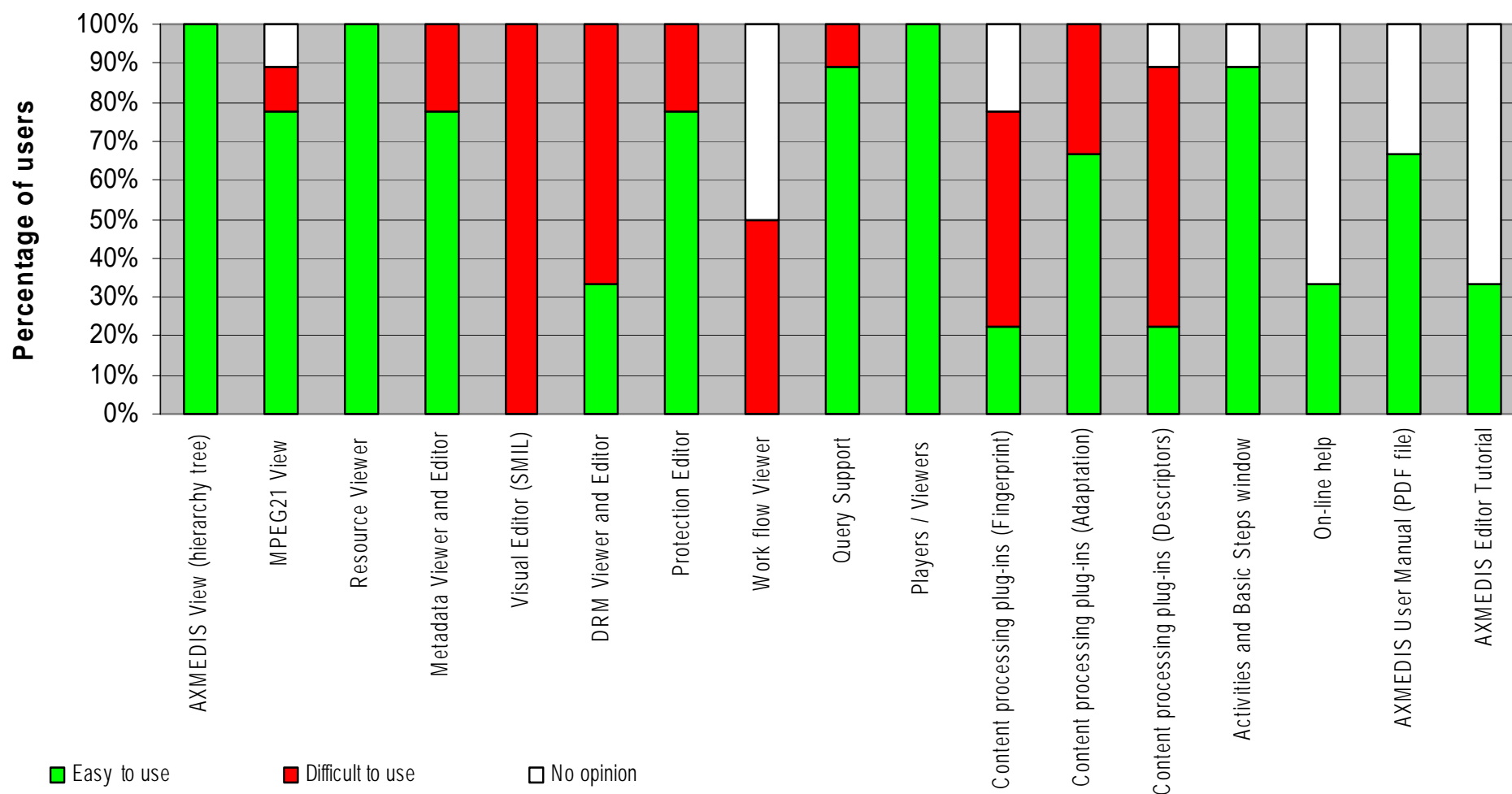


Figure 96 Features of the AXMEDIS Editor which users find useful, 9 users



**Figure 97: Features of the AXMEDIS Editor and how easy (or difficult) they were to use**

**What users find most attractive about the AXMEDIS Editor:**

- The possibility to modify and “mix” content
- Query Support
- It's a full featured MPEG-21 editor
- Metadata Editor and Viewer
- It can handle many different resource formats

**What users find least attractive about the AXMEDIS Editor:**

- Fingerprint Extractor
- Interface
- It doesn't work from behind a corporate firewall
- Some of the plug-ins
- Sometimes slow to react, or doesn't refresh automatically (e.g. see the resize image plugin)
- Too many things (buttons, inputs, windows, subwindows)
- No intuitive reading logic (up/down, left/right), also inconsistencies between action (sometimes you have to press a button, sometimes you do not have to)

**Features which users miss:**

- Possibility of editing resources like txt and html from Editor
- An integrated license editor (not for PAR, but for real licenses)
- More consistency and intuitive reading logic

**The most desirable single improvement which users would like to see in the AXMEDIS Editor:**

- Possibility of editing resources like txt and html from Editor
- The license editor
- Context sensitive and context (e.g. labels) help

**Comparison of the AXMEDIS Editor with the current way of how users work**

Two users believe they can find AXMEDIS Objects faster with AXMEDIS Query Support. Four users do not see a difference to the current way of work. Two users find the current way of work faster. One user does not have an opinion.

With respect to ease of use two users do not see a difference between using the AXMEDIS Editor or no tools. Five users find it somewhat easier to work without AXMEDIS Editor and one user finds it significantly easier to work without it.

Only one user somewhat prefers to use the AXMEDIS Editor instead of continuing work in the current way.

**Added value of the AXMEDIS Editor.** Five users consider the AXMEDIS Editor of added value. The added value was described as:

- “integration aspect of several tool otherwise separated”.
- “integrated functionalities & embedded programming features”
- “some included features like protection”
- “store content in a "universal" format based on MPEG-21”
- It could add possibility to develop integrated objects without using specific software.

### **Comparison of the AXMEDIS Player with the current way of how users work**

Only one user compared the AXMEDIS Player with the current way he is using tools for playing content: single file players.

Four users do not find the AXMEDIS Player easier to use compared to their current way of work. Five users find the current way of work easier.

Only one user somewhat prefers to use the AXMEDIS Player instead of continuing work in the current way. For three users it does not make a difference and five users somewhat prefer not to use the AXMEDIS Player.

**Added value of the AXMEDIS Player.** Two users consider the AXMEDIS Player of added value and describe the added value with:

- “embedded management of DRM and protection”.
- “embedded protection”

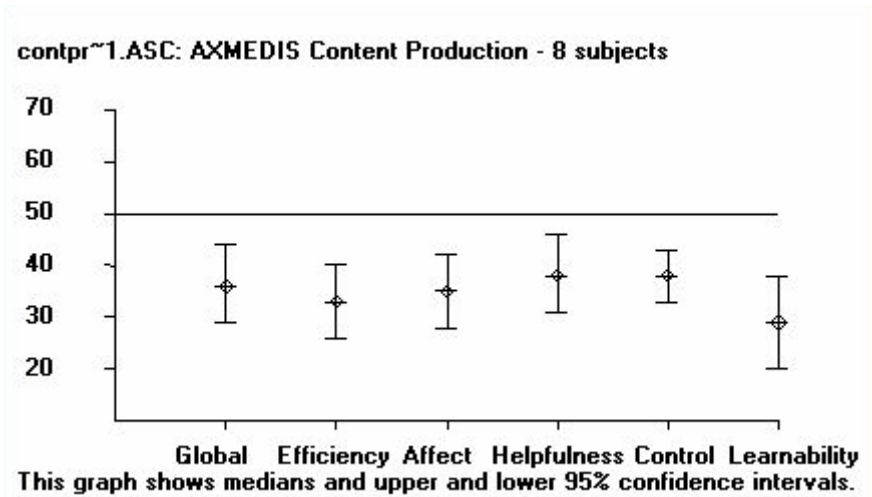
### **Evaluation of the AXMEDIS Content Production Tools with SUMI**

After the tests were completed, the subjects were assumed to be familiar with the AXMEDIS Tools. To conclude the test, the Software Usability Measurement Inventory (SUMI) was administered to each subject. SUMI gives a detailed view of the subjective assessment of the usability of the AXMEDIS Tools.

SUMI measures five independent factors of user satisfaction:

- Efficiency refers to the user's feeling that the software enables them to perform their tasks in a quick, effective and economical manner.
- Affect refers to the positive user feeling of the user being mentally stimulated and pleased as a result of interacting with the software.
- Helpfulness refers to the user's perceptions that the software communicates in a helpful way and assists in the resolution of operational problems.
- Control refers to the feeling that the software responds in an expected and consistent way to input and commands.
- Learnability refers to the feeling that the user has that it is relatively straightforward to become familiar with the software.

The result of the SUMI analysis is shown in Figure 98 and in Table 1. Results show that the overall assessment of users is below average.



**Figure 98: Results of the SUMI profile analysis for the AXMEDIS Content Production Tools, 8 users (1 user did not yet complete SUMI). The graph shows medians, upper and lower 95% confidence intervals and upper and lower limits of the data distributions.**

Usability Scales	Upper Limit	Upper 95% Confidence Limit	Median	Lower 95% confidence Limit	Lower Limit
Global	59	44	37	29	14
Efficiency	59	40	33	26	7
Affect	47	42	35	28	24
Helpfulness	69	46	38	31	14
Control	54	43	38	33	21
Learnability	67	38	29	20	7

**Table 1: SUMI Profile Analysis for the AXMEDIS Content Production Tools, 8 users**

The users who completed the SUMI assessment are not satisfied with the usability of the AXMEDIS Content Production Tools (Global usability was rated 13 scale points lower than the average). Users do not like using these tools very much (Affect was rated 15 scale points lower than the average). The AXMEDIS Tools are considered difficult to use (Learnability was rated 21 points lower than the average and Helpfulness was rated 12 points lower than the average). Control of tools, the feeling that the software is responding in an expected and consistent way, is considered less than average (Control was rated 12 point lower the average). The majority of users considered the AXMEDIS Content Production Tools to be no less efficient than the comparable way they currently work (Efficiency was rated 17 scale points lower than the average).

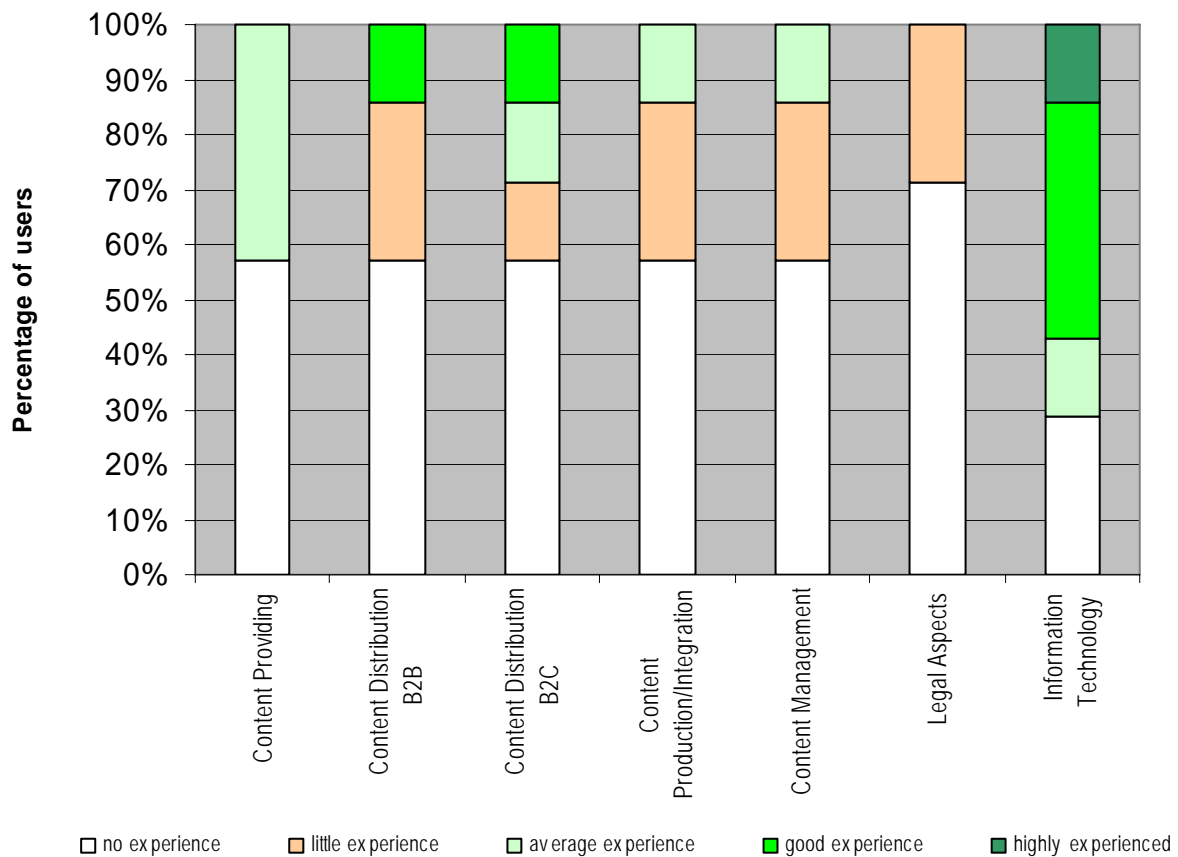
Overall, users are not satisfied with the AXMEDIS Content Production Tools not satisfying. A reason for this negative response may be that content production is not the usual work of the users who participated in the test.

[Note: The SUMI test is scaled to a mean of 50, while 10 scale points correspond to one standard deviation.]

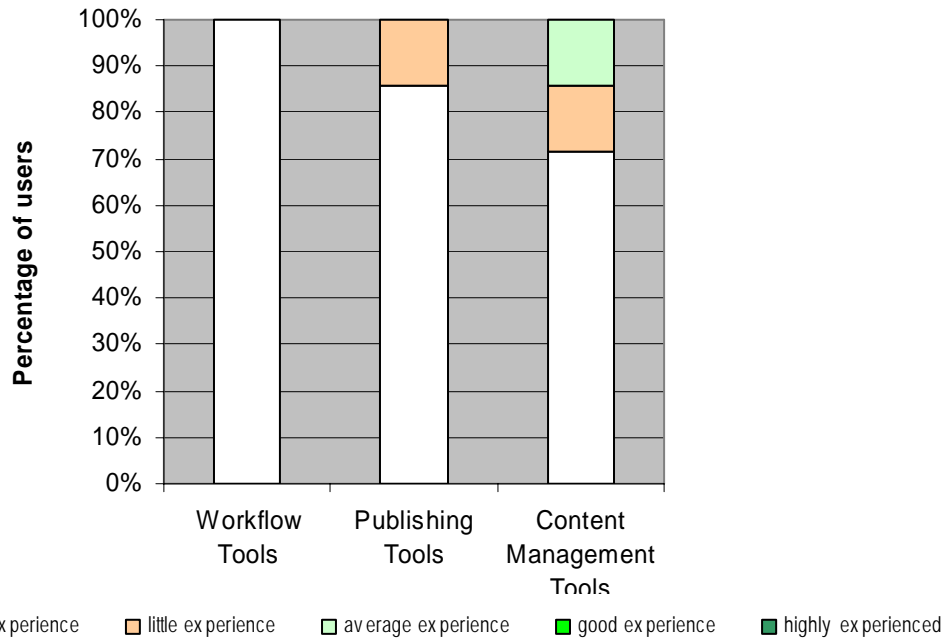
### 5.7.2 Results - AXMEDIS Content Distribution Tools

#### User sample

Seven users participated in this test. Overall, the user sample does not match the target group of content production tools very well, because four users state that they do not have experience in the content distribution domain (Figure 100). Six of the users have no experience with content management tools, one user each have little and average experience (Figure 101).

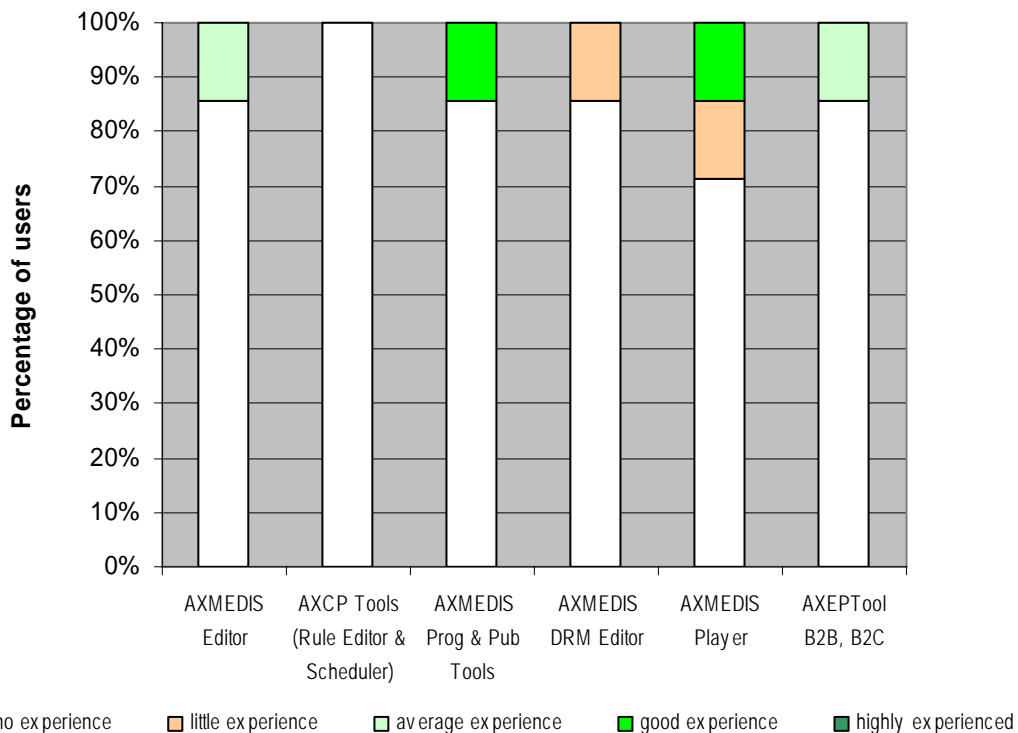


**Figure 99: Personal experience of users in cross-media publishing, 7 users**



**Figure 100: Personal experience in tool use (other than AXMEDIS Tools), 7 users**

Only one user has good experiences in the use of the AXMEDIS Programme & Publication Tools (Figure 102).

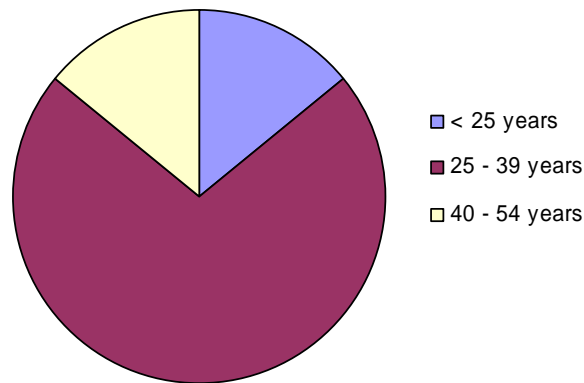


**Figure 101: Experience in the use of AXMEDIS Content Distribution Tools, 7 users**

Six users each have been using the Programme and Publication Tools for less than 1 month., and only one user for more than a year.



The age of users varies in the range from <25 years to 54 years (Figure 103). The gender distribution of the user sample is not balanced (2 female, 5 male users).



**Figure 102: Age distribution of the sample, 7 users**

### **Assessment of the installation, registration and certification of AXMEDIS Content Distribution Tools**

Questions about the installation, registration and certification of AXMEDIS Tools were only completed by users who had installed the tools themselves.

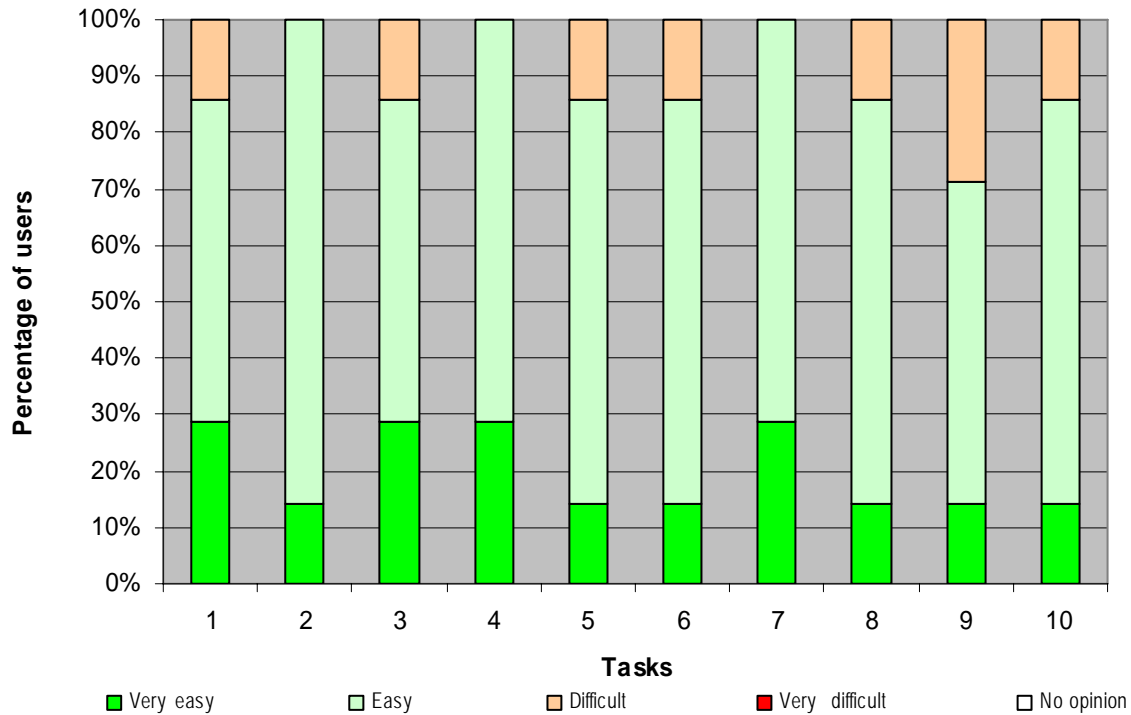
Two users have done a full installation of the AXMEDIS Tools themselves and found the installation very easy. One user considered registration and certification of tools easy.

### **Assessment of the AXMEDIS Content Distribution Tools**

**How easy (or difficult) did users find the tasks?** All subjects were able to solve the tasks in the task scenario with the AXMEDIS Content Distribution Tools:

- Task 1: Familiarize with the AXMEDIS Programme and Publication Editor
- Task 2: Create a P&P programme
- Task 3: Select content from the available sources
- Task 4: Archive the P&P programme
- Task 5: Test the P&P programme
- Task 6: Activate the P&P programme
- Task 7: Modify the schedule of a P&P programme
- Task 8: Watch the distribution of programmes, delete and activate programmes
- Task 9: Content Adaptation
- Task 10: Configure the P&P distribution channels

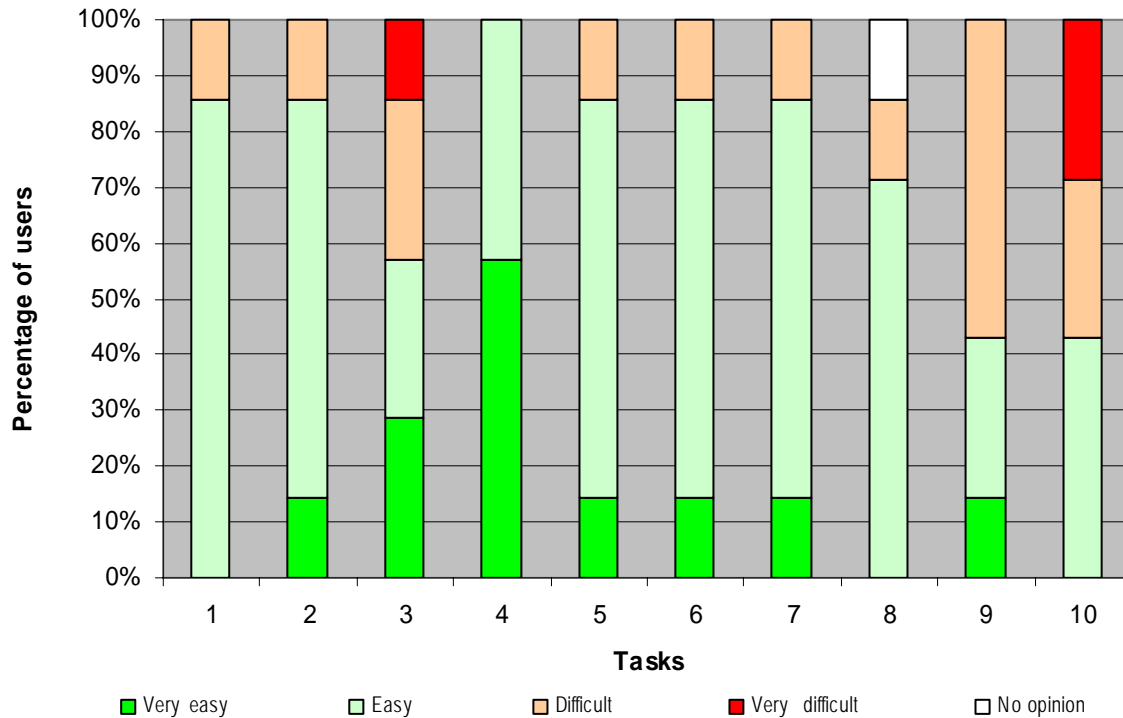
For the majority of users the tasks in the task scenario are easy or very easy (Figure 104).



**Figure 103: How easy (or difficult) do users find the tasks, 7 users**

**How easy (or difficult) was it to use the AXMEDIS Content Distribution Tools for the completion of the tasks?** Using AXMEDIS P&P Tool for the completion of tasks was considered easy and sometimes very easy for the majority of users. Three users had difficulties with the selection of content from the available sources (task 3) and four users had difficulties with content adaptation (task 9) and with configuring the P&P distribution channels (task 10).

Figure 106 illustrates the features of the Programme & Publication Editor, which users find useful, and figure 107 shows which of these features users find easy (or difficult) to use.



**Figure 104: How easy (or difficult) do users find to use the AXMEDIS Content Distribution Tools for the completion of the tasks, 7 users**

**Users’ satisfaction with the time the system takes to respond.** On average four of the users are satisfied or very satisfied with the response time of the system, two users are less satisfied or not satisfied, and another two users do not have an opinion about this issue.

**Users’ opinion about the way the system asks for user input.** Four users like the way the system asks for user input. Three users do not like some aspects, eg. “the windows are not very clear”, “a wizard would make life easier”.

**Feedback about the status of work.** Two users miss feedback about the status of work: “Missing size and type of all files”, “Visibility during the distribution phase”.

**Functions other than those provided in the AXMEDIS Content Distribution Tools that could have helped users complete a task easier and/or quicker.** Four users mentioned additional functions that could have helped completing a task easier and/or quicker:

- Specified object size
- Next and previous month in calendar
- Possibility to order the answer to db query by clicking on the table header.
- Possibility to select more than one content in the result page by holding ctrl key (already work on the screen but without any effect)
- Context menu in the programme tree window

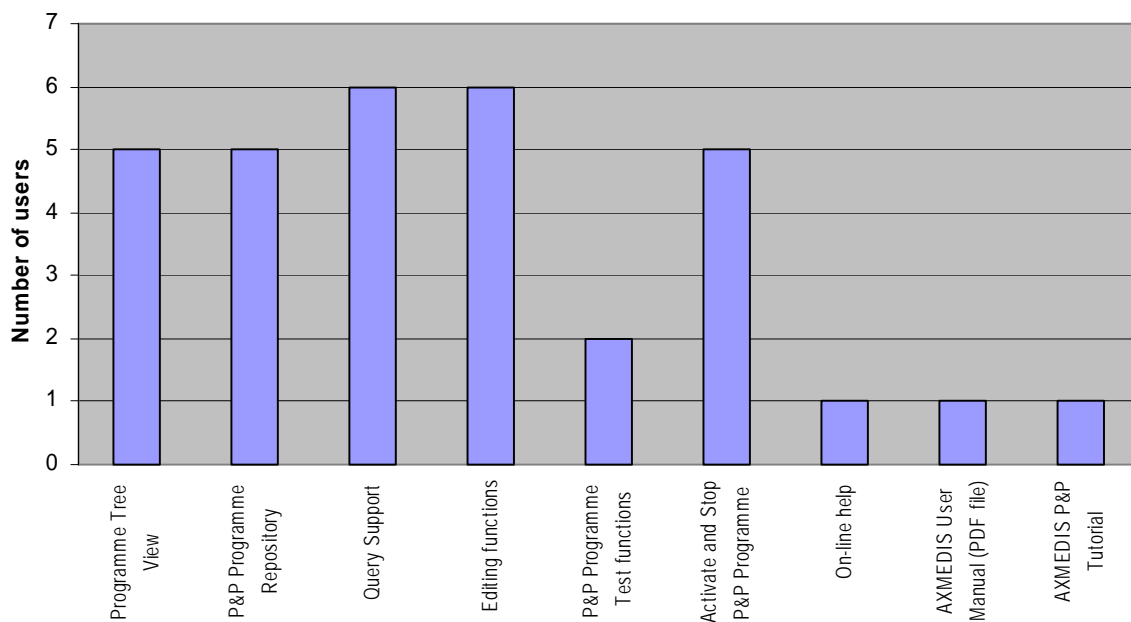
**Usefulness of the AXMEDIS Query Support.** Three users each found search for AXMEDIS Objects using defined Dublin core / AXInfo metadata very useful, two users found it useful. One user each found it distracting and very distracting: “Too many cases not necessary at every research: could hide/reveal when needed.” Three users found search for AXMEDIS Objects according to available rights/certified software very useful, another two users found this search useful. For one user this type of search was very distracting “Too many cases not necessary at every research: could hide/reveal when needed”, “It is detailed enough.”

One user had no opinion about this issue. Six users found AXMEDIS Objects in the database in reasonable time. However, “the result presentation is not so clear.”

**Further issues**

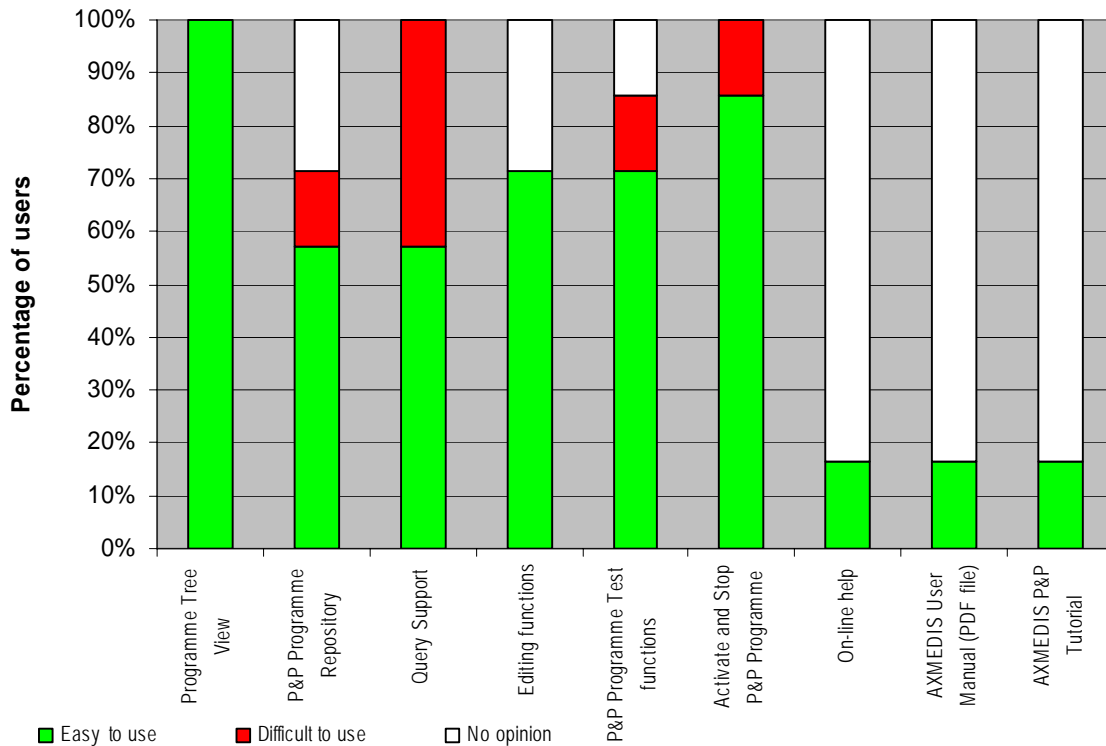
**Usefulness of the AXMEDIS Object concept.** Two users find the AXMEDIS Object concept very useful, three users find it useful. For one user the concept is of not useful and another user does not have an opinion about the concept.

**Usefulness of the AXMEDIS Content Distribution Tools in helping users doing their work.** One user finds the tools useful: “I can add kinds of multimedia and protection information to an object.” Another two users find it of limited use and not useful. Four users do not have an opinion.



**Figure 105: Features of the AXMEDIS P & P Editor which users find useful, 7 users**

Figure 106 illustrates the features of the Programme & Publication Editor, which users find useful, and figure 107 shows which of these features users find easy (or difficult) to use. Most of the users do not have an opinion about the user support (on-line help, manual, tutorials). Few users have difficulties with access to repository and databases, and with testing and activating the P&P programme. It seems that they have not made much use of it.



**Figure 106: Features of the AXMEDIS P&P Editor and how easy (or difficult) they are to use, 7 users**

**What users find most attractive about the AXMEDIS P&P Editor:**

- The function of add/insert objects from database
- Tree view size
- Gives a lot of power with high ease of use
- Sending programm to a P&P repository for archiving
- Debugging window
- simple rights management
- Sending programm to a P&P engine

**What users find least attractive about the AXMEDIS P&P Editor:**

- P&p query dialog
- The result presentation of a query
- P&P query dialog
- It seems the user have to configure the Axmedis editor first before using this tool
- not easy to use initially but learning curve is not too steep
- Too many windows
- Global interface look like 10years old
- The way to change the dates without next and previous month button
- 2- There are too many tags, and a beginner have to learn them
- Windows too charged with objects (buttons, tabs, etc..)
- The configuration window

**Features which users miss:**

- Too many cases not necessary at every research: could hide/reveal when needed.
- Possibility to reorder the results of a query.
- Possibility to select more than one content from the same result page.

- Add Axmedis object from local disk.

**The most desirable single improvement which users would like to see in the AXMEDIS P&P Editor:**

- Improve the bug correction
- Visual interface and icons
- Add Axmedis object from local disk
- Context menu in programme tree

**Comparison of the AXMEDIS P&P Editor with the current way of how users work**

One user mentioned that he is currently using tools to publish his work such as FTP or BT.

Two users were only able to make this comparison. One user does not see a difference to the current way of work. The other user finds the current way of work faster.

With respect to ease of use these users do not see a difference between using the AXMEDIS P&P Editor or no tools of finds it somewhat easier to work without tools.

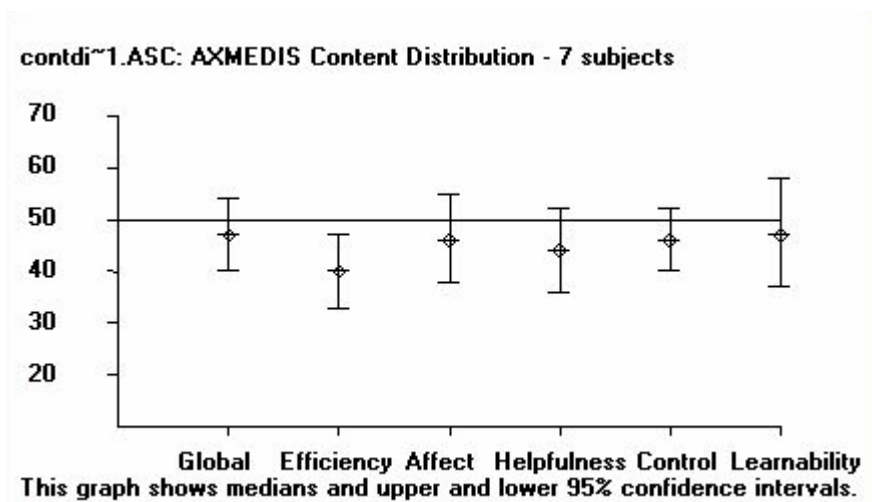
Two users who answered this question prefer to continue work in the current way.

**Added value of the AXMEDIS P&P Editor.** Only one user considers “the combination with DRM and the diversification of medias in object” an added value.

**Evaluation of the AXMEDIS Content Distribution Tools with SUMI**

After the tests were completed, the subjects were assumed to be familiar with the AXMEDIS Tools. To conclude the test, the Software Usability Measurement Inventory (SUMI) was administered to each subject. SUMI gives a detailed view of the subjective assessment of the usability of the AXMEDIS Tools.

The result of the SUMI analysis is shown in Figure 107 an in Table 2. Results show that the overall assessment of users is below average.



**Figure 107: Results of the SUMI profile analysis for the AXMEDIS Content Distribution Tools, 7 users. The graph shows medians, upper and lower 95% confidence intervals and upper and lower limits of the data distributions.**

The users who completed the SUMI assessment rate the usability of the AXMEDIS Distribution Tools average (Global usability was rated 3 scale points lower than the average). Users are not very enthusiastic  
*AXMEDIS project*

about the AXMEDIS Distribution Tools (Affect was rated 4 scale points lower than the average). The AXMEDIS Distribution Tools are considered only moderately easy to use (Learnability was rated 3 points lower than the average; Helpfulness was rated 6 points lower than the average). Control of AXMEDIS Tools, the feeling that the software is responding in an expected and consistent way, is also considered average (Control was rated 4 points below the average). The majority of users considered the AXMEDIS Distribution Tools to be less efficient than other software systems (Efficiency was rated 10 scale points below the average).

Overall, although users believe that the AXMEDIS Distribution Tools have attractive properties, they seem to be unhappy about some properties.

[Note: The SUMI test is scaled to a mean of 50, while 10 scale points correspond to one standard deviation.]

Usability Scales	Upper Limit	Upper 95% Confidence Limit	Median	Lower 95% confidence Limit	Lower Limit
Global	76	54	47	40	14
Efficiency	75	47	40	33	9
Affect	76	55	46	38	-2
Helpfulness	79	52	44	36	13
Control	71	52	46	40	23
Learnability	85	58	47	37	7

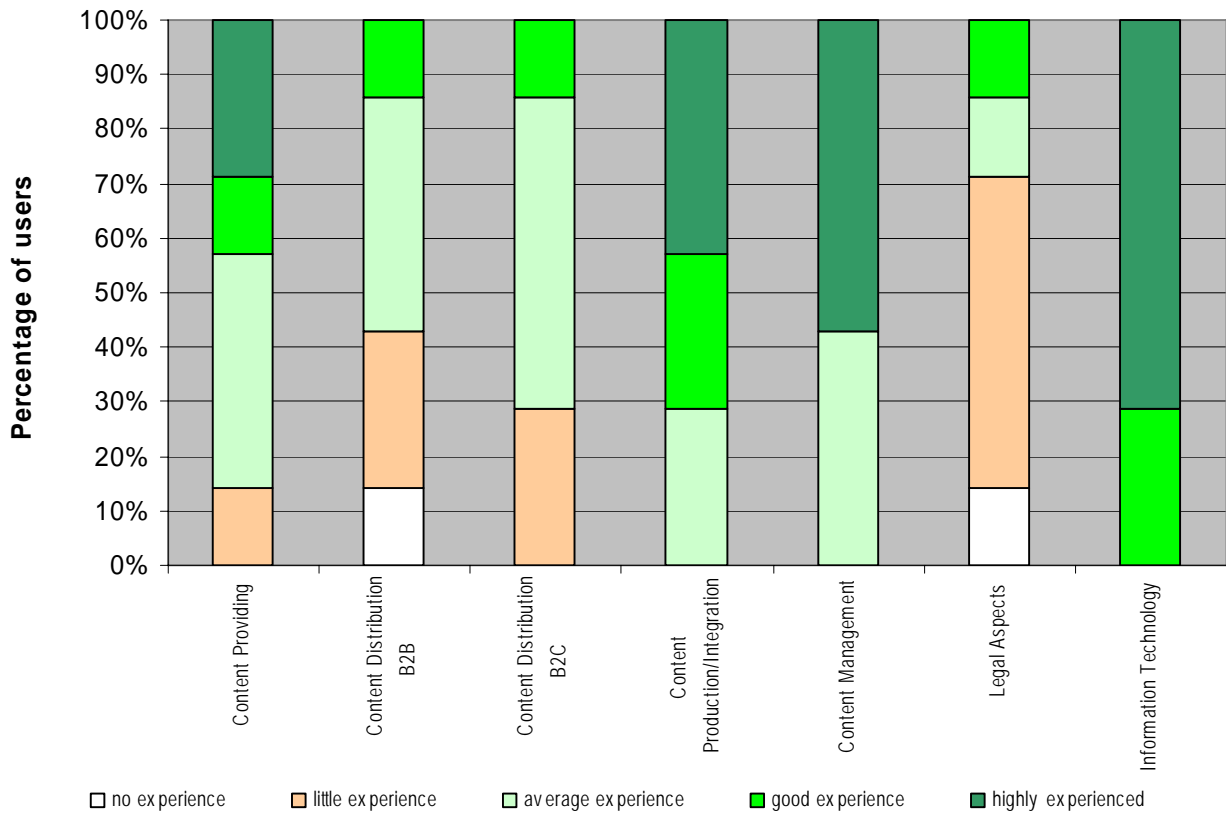
**Table 2:** SUMI Profile Analysis for the AXMEDIS Content Distribution Tools, 7 users

### 5.7.3 Results - AXMEDIS Workflow Management Tools

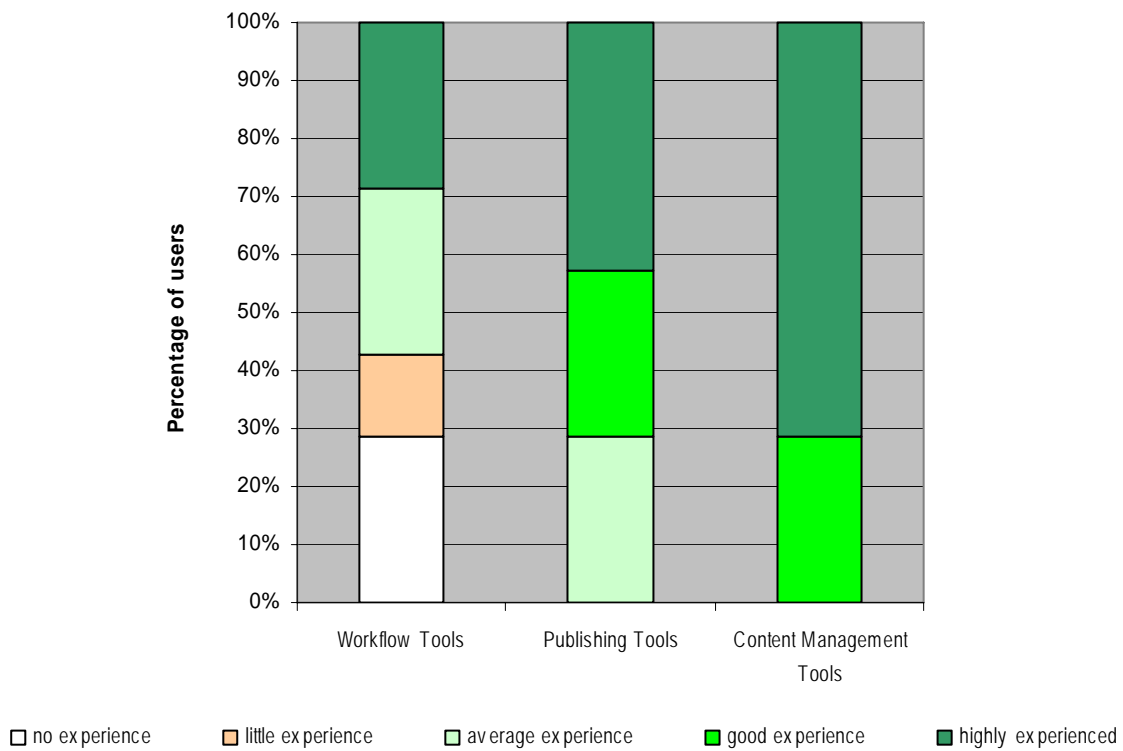
#### User sample

Seven users participated in the test. Overall, the user sample matches the target group well. All users have average to very high personal experience with content production, publishing tools, and content management tools (Figures 108 and 109). About half of the users have some experiences with workflow tools and the other half has little or now experiences in using such tools.

All users have been using the AXMEDIS Editor for a reasonable amount of time. Five users have average or good knowledge of AXMEDS WF Tools and have been using these tools for 4-12 months. The other two users have little or no knowledge of the AXMEDIS WF Tools and have been using the tools for less than a month up to 3 months (Figures 110 and 111).



**Figure 108: Personal experience of users in cross-media publishing, 7 users**



**Figure 109: Personal experience in tool use (other than AXMEDIS Tools), 7 users**



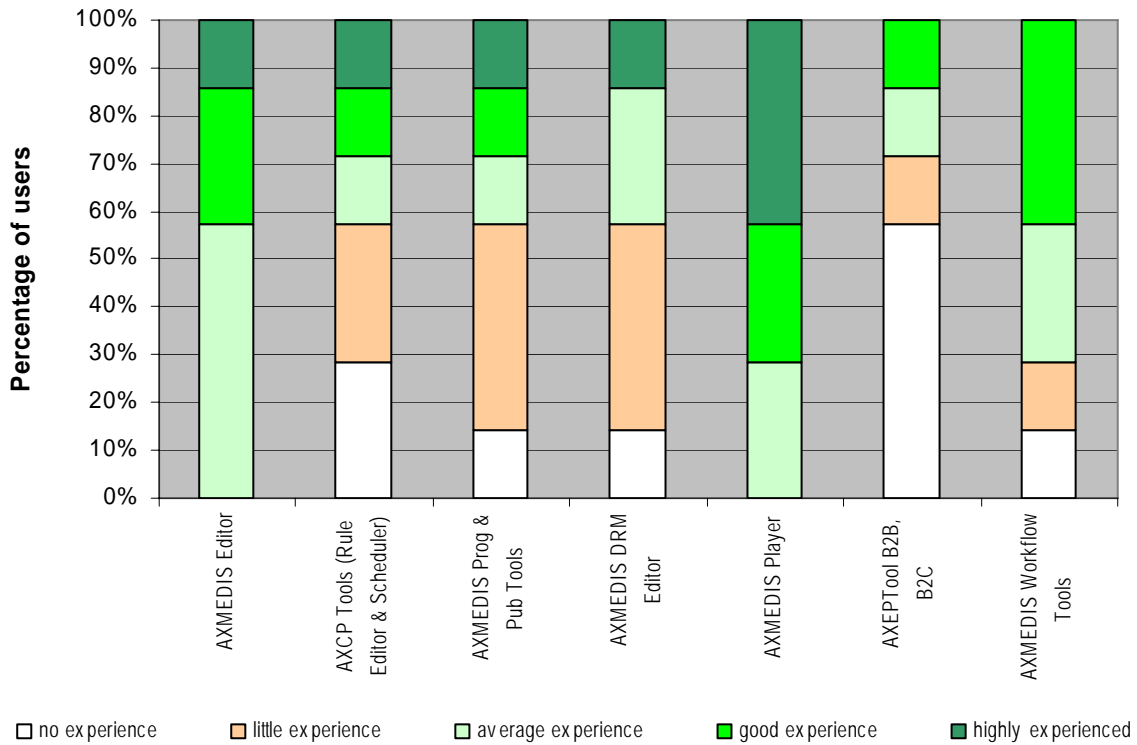


Figure 110: Personal experience in the use of AXMEDIS Tools, 7 users

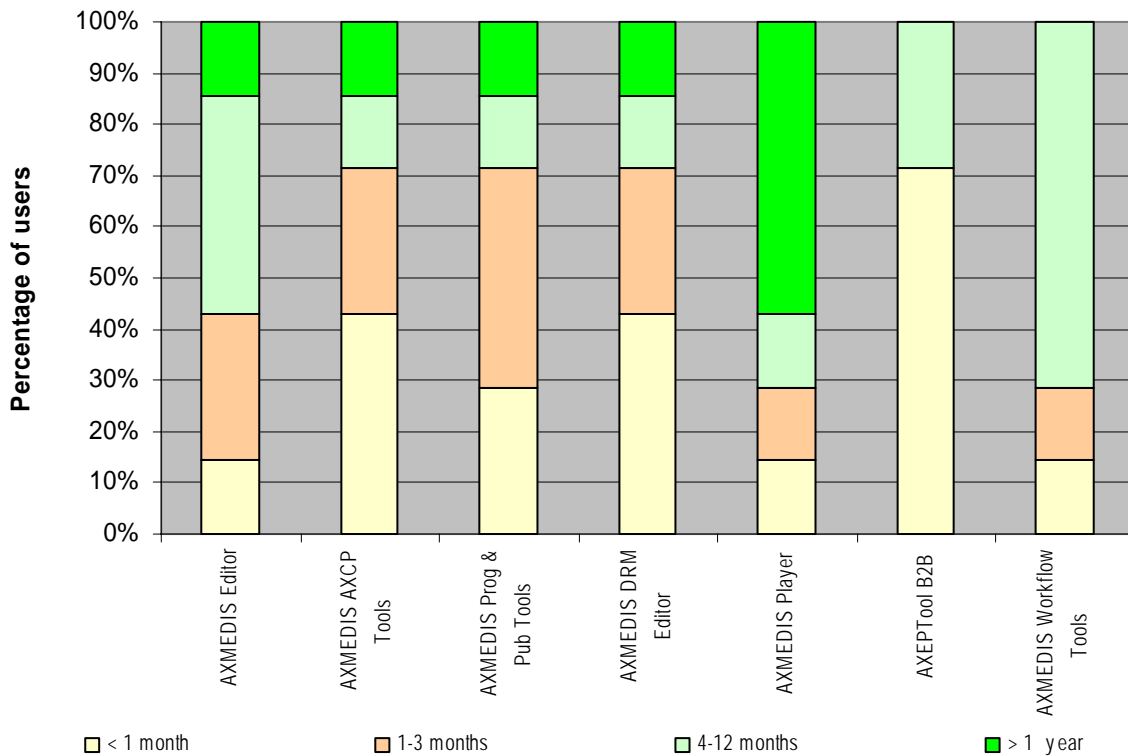
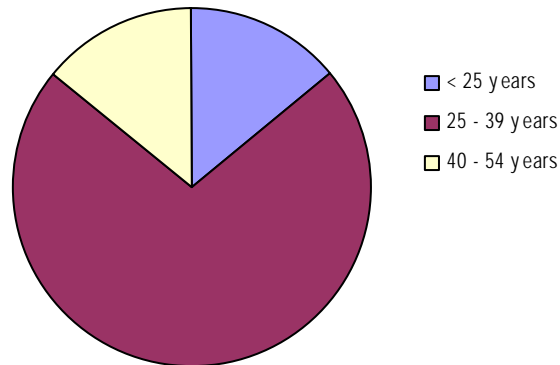


Figure 111: How long users have been using the AXMEDIS Tools, 7 users

The age of users varies in the range from < 25 years to 54 years. The gender distribution of the user sample is not balanced (2 female, 5 male users).



#### **Assessment of the installation of AXMEDIS Workflow Tools from the viewpoint of Workflow Administrators**

Questions about the installation of AXMEDIS Workflow Tools were completed by three technicians who had installed the AXMEDIS Workflow Tools including Openflow themselves. One of them found the installation very easy, the other two found the installation easy. From the management it was mentioned that the installation was found “easy but time consuming – a lot of third party software is required: Zope, Python, Openflow, plus specific software. Co-existence of IIS, Tomcat & Zope proved difficult.”

Configuration of the AXMEDIS Workflow Tools was considered very easy by one technician, easy by the other two technicians. The remark was made that “the overall configuration of all services must be included and one needs to ensure functioning”.

Using the provided web services was considered very easy by one technician, easy by the other two technicians.

Two bugs were detected in the installation, due to “co-existence of some of the products”, and because “some configuration details were not elsewhere specified”.

One technician is moderately satisfied with the level of information provided by the return channel, while the other two technicians are not satisfied.

Two technicians are moderately satisfied with the structure of the invoke methods for activating functions, the third technician is not satisfied, because “it is not flexible – only a few kind of calls are possible”.

One technician is satisfied with the Workflow installation manual and tutorial. The other two technicians are only moderately satisfied with manual and tutorial.

Two technicians consider the generation of stubs easy, the other technician has no opinion about it.

All three technicians found it difficult to debug the stubs because “specific language knowledge is needed”, there is a “need of checking the source code and browsing for several pages”, “no logs, need to open code directly”.

**Assessment of the creation of a Workflow Process from the viewpoint of Workflow Managers**

Both managers find it difficult or very difficult to create a new workflow process, to make changes to the workflow process and to make adaptations to work tasks. Managing the work which is performed by workers and managing work which is performed automatically are considered less difficult tasks.

One manager finds it very difficult to use the AXMEDIS Workflow Tools for the creation of a new workflow process, for making changes to the workflow process and for making adaptations to work tasks. This manager finds it difficult to manage the work which is performed by workers and to manage work which is performed automatically. The second manager did not provide his opinion to this question.

Both managers are moderately satisfied with the time the Workflow Tools take to respond.

One manager likes the ways the Workflow Tools ask for user input. The other manager does not like it, because "some information was initially unclear". One of the technicians remarked that the way the Workflow Tools ask for user input is "programmer oriented, not end user friendly".

Both managers miss feedback about the status of work, e.g. the "information about the AXOID". Further comments made by the technicians involved in the test were that when things go wrong, too little information about the error is provided. No logs can be found.

**Assessment of the Workflow functionality from the viewpoint of Workflow Managers**

The following table shows which features of the AXMEDIS Workflow Tools managers find helpful and their rating of how easy or difficult these features are to use.

	Helpful features		Easy to use	Difficult to use	No opinion
Show information about a component of a process design	0			1	1
Global view of all information of a work process	1		1		1
Search the db for a project design	0				2
Track components	2		2		
Timestamp Generator	1				2
List work	2		2		
Change the state or phase of a work task			1		1
Sending of information to an individual related to the state or end of a work task	1			1	1
Guide to AXMEDIS Workflow (On-line help)	1		2		
AXMEDIS User Manual (PDF file)	2		2		
AXMEDIS Workflow Tutorial	2		2		

**Figure 111: Features which managers find helpful in the AXMEDIS Workflow Tools and how easy (or difficult) they are to use**

The two managers find the AXMEDIS Workflow Tools useful and moderately useful.

**What managers find most attractive about the AXMEDIS Workflow Tools: "its possibilities".**

**What managers find least attractive about the AXMEDIS Workflow Tools:** “Its installation and configuration”.

**Features which managers miss:** “Frequently asked questions and answers”.

**The most desirable single improvement which managers would like to see in the AXMEDIS Workflow Tools:** “Provide frequently asked questions and answers”.

Both managers answered the question if they would recommend using the Workflow Tools to their colleagues (if they are fully integrated) with yes, because of “easier operation sync among actors” and “higher integration of processes in a cooperative environment”. For the same reasons these managers answered the question if they would use the Workflow Tools themselves (if they are fully integrated) with yes.

Both managers are neither convinced that using the AXMEDIS Workflow Tools will improve the efficiency nor the effectiveness of their work. Their comments to these questions were that they usually do not produce content. However, they believe that ineffective activities such as “human based communication” may become obsolete when you use the AXMEDIS Workflow Tools. However, both managers are convinced that the AXMEDIS Workflow Tools will improve the quality of their work, because “things will be more organised and tracked”.

#### **Comparison of the AXMEDIS Workflow tools with the current way of work from the viewpoint of managers**

Both managers believe that they work somewhat faster without the AXMEDIS WFM Tools, that it is easier for them to work without these tools, and therefore they prefer not to use the tools. However, compared to their current way of work they state that the AXMEDIS Workflow Tools would be of added value, because of “easier operation sync among actors” and “native integration inside the tool suite”.

#### **Assessment of the Workflow User Interface in the AXMEDIS Tools from the viewpoint of workers**

Seven users were involved in the test of the Workflow User Interface (all test user, managers, technicians and graphic artists were allowed to play the role of the workers). The majority of these users playing the role of workers find the tasks, they have to perform related to workflow management easy ( “sign in to task” and “notify task completion”). “Check for task changes and adapt to them” is considered a difficult task by some of the workers.

Most of the workers consider using the AXMEDIS Workflow User Interface to AXMEDIS Tools easy to use, one worker considers it very easy to use. One user considers the AXMEDIS Workflow User Interface difficult to use, and 2 users did not have an opinion.

Four users were moderately satisfied with the time the Workflow User Interface took to respond, one user was satisfied, and another worker was very satisfied. One user had no opinion.

Six workers liked the way the Workflow User Interface asked for user input. One worker did not like the user interface, because it is “too essential, would need more details/explanations”.

#### **Assessment of the Functionality of the Workflow User Interface in AXMEDIS Tools from the viewpoint of workers**

The following table shows which features of the AXMEDIS Workflow User Interface in AXMEDIS Tools workers find helpful and their rating of how easy or difficult these features are to use.

	Features found helpfulness		Easy to use	Difficult to use	No opinion
Show information about a component of a process design	0		2	0	5
Global view of all information of a work process	2		2	0	5
Search the db for a project design	0		0	0	7
Track components	1		1	0	6
Timestamp Generator	0		0	0	7
List work	7		7	0	0
Change the state or phase of a work task	3		5	1	1
Sending of information to an individual related to the state or end of a work task	4		0	1	6
Guide to AXMEDIS Editor (On-line help)	4		4	0	3
AXMEDIS User Manual (PDF file)	4		4	0	3
AXMEDIS Workflow Tutorial	4		4	0	3

**Figure 112: Features which workers find helpful in the AXMEDIS Workflow User Interface to AXMEDIS Tools and how easy (or difficult) these are to use**

Workers cannot imagine other functions than those provided which would have helped them to complete their tasks easier and/or quicker.

Three workers answered the question if they would recommend using the Workflow User Interface (if it was fully integrated) to their colleagues with yes, the other four workers with no. Five workers would use the Workflow User Interface themselves (if they are fully integrated).

Two workers find the Workflow User Interface helpful to do their work, three workers find it only moderately helpful and one worker does not find it helpful at all.

Workers consider the “List work” feature the most attractive issue of the AXMEDIS Workflow User Interface.

**Comparison of the AXMEDIS Workflow User Interface in AXMEDIS Tools from the viewpoint of managers**

The workers do not believe that using AXMEDIS Workflow Management Tools will improve the efficiency or effectiveness of their work and provided as the reason “we do not produce or manage content usually”. There opinion is that “manual communication of work to be done” will be the ineffective activity which may become obsolete when they use AXMEDIS WFM Tools. However, all Workers are convinced that the quality of work will improve through “easier cooperation and better flow of information” with the AXMEDIS WFM Tools.

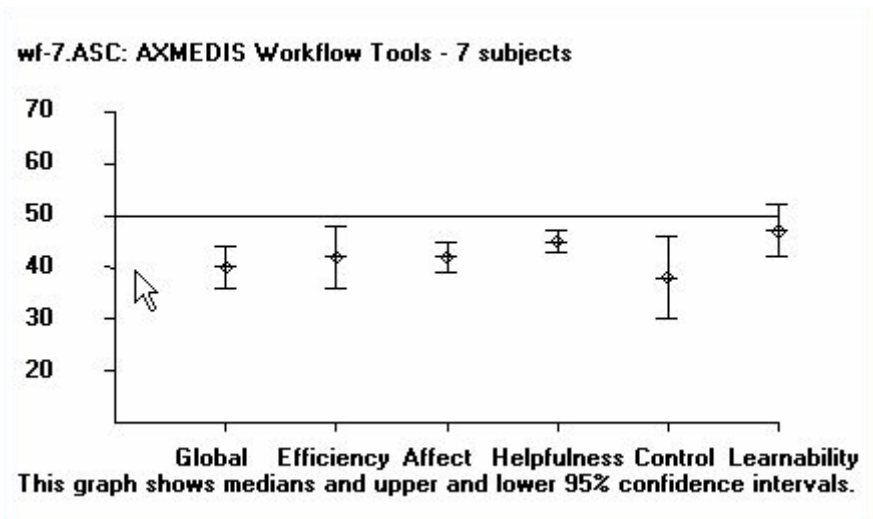
The workers think they cannot perform their work faster with the AXMEDIS WFM Tools. Four of the workers believe they work somewhat faster without WFM Tools.

Four workers are convinced that it is somewhat easier to do their work without AXMEDIS WFM Tools and therefore they prefer not to use the AXMEDIS Workflow User Interface to AXMEDIS Tools.

Four workers are convinced that the AXMEDIS WFM Tools can be of added value because of better management of work.

**Evaluation of the AXMEDIS Workflow Tools with SUMI**

After the tests were completed, the users were assumed to be familiar with the AXMEDIS WFM Tools. To conclude the test, the Software Usability Measurement Inventory (SUMI) was administered to each user. The result of the SUMI analysis is shown in Figure 90 and in Table 3. Results show that the overall assessment of users is below average.



**Figure 113: Results of the SUMI profile analysis for the AXMEDIS WFM Tools, 7 users. The graph shows medians, upper and lower 95% confidence intervals and upper and lower limits of the data distributions.**

Usability Scales	Upper Limit	Upper 95% Confidence Limit	Median	Lower 95% confidence Limit	Lower Limit
Global	59	44	40	36	23
Efficiency	63	48	42	36	14
Affect	51	45	42	39	33
Helpfulness	52	47	45	43	40
Control	76	46	38	30	2
Learnability	61	52	47	42	25

**Figure 114: SUMI Profile Analysis for the AXMEDIS WFM Tools, 7 users**

The users who completed the SUMI assessment rate the usability of the AXMEDIS WFM Tools lower than average (Global usability was rated 10 scale points lower than the average). Users are not very enthusiastic about the AXMEDIS WFM Tools (Affect was rated 8 scale points lower than the average). The AXMEDIS WFM Tools are considered only moderately easy to use (Learnability was rated 3 points lower than the average; Helpfulness was rated 5 points lower than the average). Control of the AXMEDIS WFM Tools, the feeling that the software is responding in an expected and consistent way, is considered very low (Control

was rated 12 points below the average). The majority of users considered the AXMEDIS WFM Tools to be less efficient than other software systems (Efficiency was rated 8 scale points lower than the average).

[Note: The SUMI test is scaled to a mean of 50, while 10 scale points correspond to one standard deviation.]

#### **5.7.4 How easy to understand and how useful are the icons on the desktop of AXMEDIS Tools**

The objective of this test was to assess the extent to which users understand the new icons on the desktop of AXMEDIS Tools.

A test was created which consists of three parts:

- In the first part users were confronted only with a list of icons and they had to recall and write down the function for each icon in the list.
- In second part, users were provided with the same list of icons together with 3 to 4 functions per icon, amongst them the correct function. Users had to recognize and select the correct function for each icon in the list.
- Finally, in the third part, users had to rate how easy is to understand and how useful they consider each icon.

Users had to work through the three parts from the beginning to the end, i.e. first section 1, then section 2 and finally section 3. They had to work on their own, without help from other people and without consulting the AXMEDIS Tools and manuals. Users were asked to complete the questionnaire exactly in this order. They were not allowed to go back and complete questions previous to the question they were currently completing. When they did not know an answer they should guess or skip an icon.

#### **Results**

Tables 9 and 10 list the answers which 8 users were able to recall for the icons. This may give developers an idea of what can happen when users try to guess the meaning of abstract icons.

Tables 11 and 12 give an overview of how many users (out of 8) were able to recognize the correct function of an icon out of 3 or 4 functions provided.

Table 13 summarizes the ratings of the ease of understanding of icons and table 13 summarizes the ratings of the usefulness of icons. The most positive rated icons are marked green, the most negative rated icons are marked red.

This is only a preliminary analysis of the results. The study is not yet completed.

DE4.9.1.3 – The Usability Issues for the AXMEDIS production tools

Icon	Command Name	User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8
	Open from database	Open repository	open db	database query	out of data base	Get from database	get from DB	take from database	take from database
	Upload into database	Save on repository	save db	save the database data	save database	Save file into database	save on DB	save database	save database
	Register to AXCS			?	?	Register to AXCS	?	?	?
	Add embedded resource		add ?	add a connection to a database	?	Add resource from local disk	add resource	?	?
	Add embedded object	Add protected AXMEDIS object	add ?	?	?	Embed object	add Object	?	?
	Add object reference	Add AXMEDIS object	add ?	?	?	Query axmedis database	add Object	?	?
	Expand the current node	Enlarge window	expand	expand	goup godown		?	Expand vertically	Expand vertically
	Collapse the current node	Reduce window	collapse	collapse	?		?	Tight vertically	Tight vertically
	Expand All	Maximize	partial expand	expand	?		?	fit to window vertically	fit to window vertically
	Collapse All	Minimize	partial collapse	collapse	?		?	reduce to a line	reduce to a line
	Create a new grant		add ?	add an header	?	add header or something	add PAR	add a ?	add a ?
	Delete grant	Delete	delete	delete an header	delete	delete	delete	delete	delete
	Add a new condition to the grant	Add signature	edit	edit an header	write		edit?	?	?
	Delete condition of a grant	Handwrite	erase	erase	?		delete	?	?
	Show Axmedis structure	View tree		?	?		show resourses	?	?
/	Back history	Move back:previous	previous	back	previous	Left	back	move left	move left
	Forward history	Move forward/next	next	forward	next	Right	forward	move right	move right
/	Next resource	Move forward/next	right?	end	gorigth	Right	next resource	end right	end right





















**Figure 115:** Do you know the function of the following icons? Eight users tried to recall the function of icons

















DE4.9.1.3 – The Usability Issues for the AXMEDIS production tools

Icon	Command Name	User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8
	Previous resource	Move back:previous	left?	begin	goleft	Left	previous resource	begin left	begin left
	Sliding show	Browse	open directory		open??	Open a file from local disk	file?	?	?
	Update image in AxObject	Auto save	save?	save	save???	Save	save?	?	?
	Add new query	Search on DB	search db	explore the database	zoom	Query in database	search on DB	search in database	search in database
	Open selection	Move or copy	open ?	open program	open??	Open a file from local disk	open script?	open ?	open ?
	Save selection	Save	save ?	save program	save???	Save as	save script?	save ?	save ?
	Open from database	Add on DB	add db	add a content to a database	next database	Add from database	add Object	new database	new database
	Upload into database	Store on DB	del db	remove a content to a database	previous database	Save into database	save Object	import in database	import in database
	Import query	Add folder	add ?		search??		?	?	?
	Export query	Put in folder	add file to ?		search into document		?	?	?
	Add AXCP rules functions	Wizard / guide	?		???	Create a new one	?	?	?
	Test query	Play	enter	activate program	???		play	play	play
	Test selection	Web	web				?	?	?
	Search in script	Search / Look for	seach directory	search	search folder	View	search	search ?	search ?
	Save as	Save	save file	save	save file	Save as file	save	save ?	save ?
	Save to server	Put on repository	copy file		compile		?	add to ?	add to ?
	Expand All	Expand tree	order by desc		page down		execute script	goto end	goto end
	Collapse All	Close tree	?		page up		?	goto begin	goto begin

**Figure 116:** Do you know the function of the following icons? Eight users tried to recall the function of icons

Icon	Function of the icon	Correct answers
	Open from database	7
	Upload into database	0
	Register to AXCS	6
	Add embedded resource	2
	Add embedded object	2
	Add object reference	7
	Expand the current node	3
	Collapse the current node	3
	Expand All	5
	Collapse All	5
	Create a new grant	2
	Delete grant	2
	Add a new condition to the grant	4
	Delete condition of a grant	6
	Show Axmedis structure	5
	Back / Forward history	1
	Next / Previous resource	2
	Start / Stop Sliding Show	0
	Update image in AxObject	0
	Add new query	0

**Figure 117: Number of users you were able to recognize the correct function of the icon (8 users in total)**

Icon	Function of the icon	Correct answers
	Open selection	1
	Save selection	1
	Open from database	3
	Upload into database	3
	Import query	0
	Export query	0
	Add AXCP rules functions	2
	Test query	7
	Test selection	3
	Search in script	2
	Save as	8
	Save to server	8
	Expand All	3
	Collapse All	3

**Figure 118: Number of users you were able to recognize the correct function of the icon (8 users in total)**

DE4.9.1.3 – The Usability Issues for the AXMEDIS production tools

		very easy to understand	easy to understand	difficult to understand	not comprehensible unless you know the icon beforehand
	Open from database	6	8	1	0
	Upload into database	6	5	4	0
	Register to AXCS	0	1	5	9
	Add embedded resource	0	0	4	11
	Add embedded object	0	0	4	11
	Add object reference	0	0	4	11
	Expand the current node	1	9	4	1
	Collapse the current node	1	9	4	1
	Expand All	1	9	4	1
	Collapse All	1	9	4	1
	Create a new grant	1	5	4	5
	Delete grant	1	11	0	3
	Add a new condition to the grant	1	4	5	5
	Delete condition of a grant	1	4	5	5
	Show Axmedis structure	0	6	3	6
	Back history	3	10	1	1
	Forward history	3	10	1	1
	Next resource	3	8	3	1
	Previous resource	3	8	3	1
		0	0	4	11
		0	2	5	8
	Add new query	1	6	4	4
	Open selection	1	10	2	2
	Save selection	1	10	2	2
	Open from database	1	7	6	1
	Upload into database	1	11	3	0
	Import query	1	4	8	2
	Export query	2	6	5	2
	Add AXCP rules functions	1	3	3	7
	Test query	1	8	6	0
	Test selection	0	0	6	9
	Search in script	1	11	2	1
	Save as	2	11	2	0
	Save to server	3	12	0	0
	Expand All	1	11	3	0
	Collapse All	1	11	3	0

**Figure 119: How easy to understand are these icons? Rating by 15 users**

DE4.9.1.3 – The Usability Issues for the AXMEDIS production tools

		I do like this icon	I would use this icon like any other	I would not mind a nicer icon	I strongly ask to replace this icon
	Open from database	10	4	0	0
	Upload into database	9	4	1	0
	Register to AXCS	0	6	1	7
	Add embedded resource	0	3	2	9
	Add embedded object	0	3	4	7
	Add object reference	0	3	4	7
	Expand the current node	7	4	0	3
	Collapse the current node	7	4	0	3
	Expand All	7	4	0	3
	Collapse All	7	4	0	3
	Create a new grant	3	4	1	6
	Delete grant	5	6	2	1
	Add a new condition to the grant	3	3	5	3
	Delete condition of a grant	2	2	7	3
	Show Axmedis structure	2	3	4	5
	Back history	7	4	3	0
	Forward history	7	4	3	0
	Next resource	6	5	3	0
	Previous resource	6	5	3	0
		0	1	4	9
		0	2	8	4
	Add new query	4	3	3	4
	Open selection	6	4	2	2
	Save selection	6	4	2	2
	Open from database	6	2	4	2
	Upload into database	6	6	1	1
	Import query	3	3	6	2
	Export query	4	4	4	2
	Add AXCP rules functions	2	4	3	5
	Test query	5	4	5	0
	Test selection	0	1	9	4
	Search in script	5	4	4	1
	Save as	5	6	3	0
	Save to server	9	5	0	0
	Expand All	6	5	3	0
	Collapse All	6	5	3	0

Figure 120 How useful are these icons? Rating by 14 users

## 5.8 General observations

The user tests of the AXMEDIS tools and AXMEDIS Workflow Management Tools are still in progress. A summary of the subjective assessments available so far are not too encouraging. Positive as well as critical assessments of users were collected so far which confirm the findings already known from informal user testing.

Many users, especially the beginners, seem to be overwhelmed by the many windows, sub-windows, menus, icons, buttons of the AXMEDIS Tools. Object creation itself is not considered difficult, but users encounter problems with the DRM editor, Visual (SMIL) Editor, Content Processing Plug-ins, Metadata Editor and Protection Editor. Some users bring it to the point and complain about the lack of inconsistency. Nevertheless most of the users see the challenges for the future, the possibilities of being able to edit multi media resources, to take advantage of an integrated license editor, and more.

With regard to the AXMEDIS WFM Tools users do not expect significant advantages for their personal efficiency and effectiveness. However, they are convinced that the AXMEDIS WFM Tools improve the quality of their work.

The results of the SUMI questionnaire, used to measure how users feel about the AXMEDIS Tools and AXMEDIS WFM Tools show results which lie below 50, below average, on the global usability scale as well as on all sub-scales (Efficiency, Affect, Helpfulness, Control, Learnability). Good software should achieve scores higher than 60 or more on most sub-scales. A brief investigation showed that beginners amongst the test users rated the tools less negative than the users who are familiar with the tools. The reason why the results for the AXMEDIS Tools are low needs to be investigated further.

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## 7 Glossary

**Assessment criteria** are critical values for relevant measures which are the basis for the assessment of an electronic information service or product.

**Context of use** describes the technical, physical and social environment in which the application is used.

**Critical success factors** determine the success of the electronic information application for the organization. Critical success factors can be product oriented (e.g. higher product quality, innovative design), development process oriented (e.g. more efficient and effective development process), standards oriented (e.g. product complies to standards), societal goals (e.g. product can be used by people with special needs).

**Customer** is a person who decides to purchase a system. The customer has a commercial view.

**Design guidelines** give advice about how to design a user interface.

**Design principles** are high-level and universally applicable directing guidelines.

**Formative evaluation** takes place before implementation (e.g. quality assurance during development) in order to influence the development of the product.

**Measurement** means a repeatable, objective procedure for generating a measure. The resulting measure(s) are scaled in a known way, and reference values, reliability and validity are known. Detailed information about 'Measurement' 'Construct Validity', 'Reliability', 'Levels of Measurement', 'Survey Research', 'Scaling', 'Qualitative Measures', 'Unobtrusive Measures' can be found at [trochim.human.cornell.edu/kb/measure.htm](http://trochim.human.cornell.edu/kb/measure.htm).

**Measures** are operationalized quality factors. A measure can be subjective or objective, direct or indirect, analytical or empirical.

**Method** is the formal definition of measures. It describes the means to arrive at reliable and meaningful measures. A validation method is a repeatable, systematic procedure to produce a given result. The specific aspect of validation methods as opposed to a general view of method is that user validation always starts with an objective and validation criteria, i.e. a question such as 'Is design alternative A more efficient to use than B?', 'Does the application fulfill the minimum requirements?'. A quality general factor such as efficiency is implied by the validation question, and the resulting measure must be shown to be a valid measure for such a quality factor.

**Metrics** are measures possessing metric properties which express the degree or strength of a quality factor. Metrics are obtained by an objective measurement method. Their scale of measurement is known, they possess scale metric properties, known maxima, minima and reference values, their reliability and validity are known. Metrics are interpreted according to the context in which they were measured. Metrics allow comparisons between applications, as well as between alternative versions of a single developing application, and comparisons with reference values. Conformance to standards and minimal requirements can be tested with metrics. Some metrics tell about the performance of the user applying an application to his work (e.g. efficiency of use, learning effort, errors). Other metrics predict quality of use factors on the basis of a user interface specification, prototype, or fully functional product, and an underlying user model.

**Prototype** is an experimental design of the whole or part of a system. The purpose of a prototype is to test certain aspects or characteristics of a new system. A prototype can be paper- or computer-based. A vertical prototype contains both high- and low-level functionality but for a restricted part of the system only. A horizontal prototype contains all the high-level functionality of the final system but misses out the lower-level detail. Prototypes may be scale or partial models, may be partly non-functional, or may be full-scale 'trial' objects or processes, and may be designed to be discarded. Prototyping is the simulation of an object or process which is then subjected to systematic testing. Rapid prototyping is a form of simple, rapidly produced prototyping in which the prototype is used to collect information about both the requirements and the adequacy of possible designs; it is not developed into a final product.

**Quality** is a multidimensional concept consisting of quality factors (also called quality dimensions). Quality dimensions are features by which a product can be assessed such as efficiency of use, task adequateness, cognitive workload, robustness, learning cost, user acceptance. Quality dimensions are the result of the decomposition of the term 'quality of the application'. They are variables which reflect different independent quality aspects of the application. Validation questions must be formulated in terms of quality factors in order to allow meaningful measurement.

**Qualitative data** can be categorized in some way but cannot be reduced to numerical measurements.

**Quantitative data** consists of numerical values.

**Quality of use** is used synonymously to usability. Quality of use is a concept which consists of multiple, measurable dimensions (e.g. productivity, user preferences). An application's overall quality of use is then determined by specifying the dimensions which are relevant in a certain context of use, by adding priorities to the different quality dimensions (this is optional), and by defining assessment criteria for the dimensions. Quality of use describes the user-centered view of product quality. There are other quality aspects, e.g. technical quality such as portability, maintainability, etc.

**Reliability of a measure** describes the degree of stability, accuracy and error associated with a measurement procedure. It describes the extent to which a measurement procedure yields the same result if carried out on different occasions, possibly by different people on the same object. A measure is reliable if the application of the measure yields reproducible results. Factors which could reduce the reliability of a measure could be for example number or attributes of subjects involved in experimental tests or subjective decisions made by the evaluator.

**Summative evaluation** takes place after implementation to test the proper functioning of a product and to investigate user satisfaction and preferences.

**Task** is described in terms of the goals or a desired end-result of activities a user wants to achieve. More than one user procedure (a sequence of commands to be executed to reach the goal) may exist to solve the task.

**Usability** as well as other traditional terms such as user friendliness, usefulness, ease of use, have in common that they are vague and fuzzy terms. They give the impression of just one single dimension. However, users have different needs and requirements and perform different tasks with an application. An application which is usable by one user may be tedious to use by another user. In addition usability is a too narrow concept which does not take into account cost/benefit issues. Hence, the term 'quality of use' is preferred to usability.

**Usability Engineering** is a well defined process which is performed as part of the application development process. It can be part of the development process of any type of electronic information application. Although each development project is different, the approaches, methods, techniques and activities applied to achieve usability do not vary much.

**Usability Specification** quantifies target levels of quality of use for a system in terms of: learning requirements, effectiveness, efficiency, robustness, task adequateness.

**User** is the person who uses a product or service, who has "hands-on experience".

**User-centred design** emphasizes on early and continuous involvement of users in the design process.

**User procedure** is a sequence of commands which a user must perform to solve a task or to reach a goal.

**User validation** describes the gathering of quality of use information about an application which is used within a specified context of use. The user validation process describes a set of ordered activities that contribute to a defined objective of a validation project. A user validation process takes place over time and has precise objectives regarding the results to be achieved. A User Validation Process Model describes the structure and the elements of that validation process in terms of stages and steps, dependencies and data.

**Validation** emphasizes on early and continuous involvement of users in the development process.

**Verification** checks if the developing product or service is free of errors and if fulfills the user / customer requirements described in the system specification.

**Validity of a measure** A measure is valid for a given quality aspect if there exists a correlation of the measurement values and that quality. Validity describes the extent to which a measurement procedure

measures what it is intended to measure. It is a psychometric concept, and a number of different ways of testing it have been used: Content validity: Measure of the sampling adequacy of the rules of measurement; Criterion validity: The comparison of the measures obtained against external variables or criteria; Construct validity: This refers the rules of measurement to an underlying theory or model; Ecological validity: The extent to which the conditions simulated in the laboratory reflect real life conditions. Face validity: Does the measure appear to be measuring something sensible.